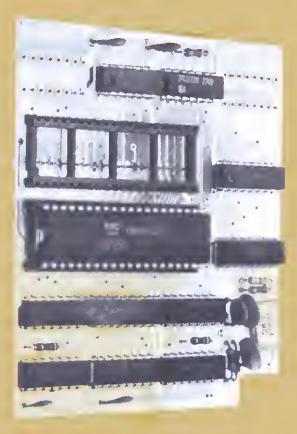
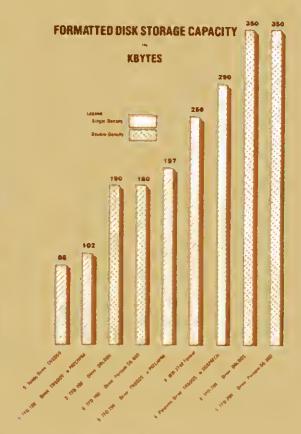


Store Up to 350 Kbytes on a 5" Disk





The DOUBLER™. It packs almost twice the data on a disk track as your single-density system. Depending on the type of drive, you can store up to four times more data on one side of a minidiskette than you can store using a standard Model I mini-disk drive.

- The DOUBLER™ reads, writes and formats either single- or double-density minidiskettes.
- Proprietary design allows you to: continue to run TRSDOS*, NEW-DOS‡, Percom OS-80™ or other single-density software without making any changes to software or hardware. Switch to doubledensity operation at any convenient time.
- Includes DBLDOS™, a TRSDOS* compatible doubledensity disk operating system.

Mini-Disk Systems



More storage capacity, higher reliability - from Percom, the industry teader One- two- and three-drive configura tions in either 40 or 77-

track format. Fully burned-in. From only

- CONVERT utility, on DBLDOS™ minidiskette, converts files and programs from single- to double-density or double- to single-density.
- The DOUBLER™ circuit card includes high performance data separator, write precompensation circuits for reliable disk read operations - even with 80-track drives.
- Plug-in Installation The DOUBLER simply plugs into the disk controller socket of your Ex-

PERCOM DISCOUNT \$20 COUPON worth \$20 toward The Purchase of a DOUBLER™ Coupon No. 80M103 Expires December 30, 1980 Void where prohibited by law. \$20

pansion Interface, requiring no strapping or trace cutting. Expansion Interface disk controller may be completely restored to original configuration by simply removing the DOUBLER™ and re-installing the original disk controller chip.

 Works with standard 35-, 40-. 77- and 80-track mini-disk drives rated for double-density operation. Introductory price, including DBLDOS™ and format conversion utility on minidiskette, only \$219.95. Use the coupon for even greater savings.

Call toll-free, 1-800-527-1592, for the address of your nearest authorized Percom dealer, or to order directly from Percom.



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* trademark of Tandy Radio Shack Corporation which has no relationship to Percom Data Company, 2 trademar; of Apparat Company, Inc.



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And double-density storage is here in a big way. Because now you can choose from three different levels of mini-disk systems all double-density roted.

And get the storage that precisely meets your application

Nor to mention the service and quality that's made Percom the industry leader.

Although rated for double-density operation, all levels of Percom drives work equally well in singledensity applications.

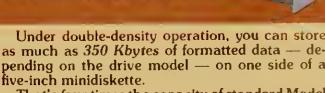
You can operate these drives in ordinary singledensity format using TRSDOS*, Percom OS-80™ or any other single-density operating system.

Or, you can add a Percom DOUBLER™ to your Tandy Expansion Interface and store data and programs in either single- or double-density format.

Under double-density operation, you can store as much as 350 Kbytes of formatted data - depending on the drive model — on one side of a

That's four times the capacity of standard Model I mini-disks, almost 100 Kbytes more than the capacity of the eight-inch IBM 3740 format!

Available in 1-, 2- and 3-drive configurations in all three model lines, Percom burned-in, fullytested drives start at only \$399.



TFD-40™ Drives



TFD-40 Drives store 180 Kbytes (double-density) or 102 Kbytes (single density) of formatted data on one side of a 40-track minidiskette. Although economically priced, TFD-40 drives receive the same full Percom quality control measures as TFD-100 and TFD-200

TFD-100™ Drives



TFD-100 drives are "flippy" drives. You store twice the data per minidiskette by using both sides of the disk. TFD-100 drives store 180 Kbytes (double-density) or 102 Kbytes (single-density) per side. Under double-density operation, you can store a 70page document on one minidiskette.

TFD-200™ Drives



TFD-200 drives store 350 Kbytes (double-density) or 197 Kbytes (single-density) on one side of a minidiskette. By companison, 3740-formatted eight-inch disks store only 256 Kbytes. Enormous on-line storage capacity in a 5" drive, plus proven Percom reliability. That's what you get in a TFD-200.

the DOUBLER™



- This proprietary adapter for the TRS-80* Model I computer packs approximately twice the data on a disk track

Depending on the type of drive, you can store up to four times as much data — 350 Kbytes — on one side of a minidiskette as you can store using a Tandy standard Model I comtil puter drive.

Easy to install, the DOUBLER merely plugs into the disk controller chip socket of your

Expansion Interface. No rewining. No trace cutting

And because the DOUBLER reads, writes and formats either single- or double-density disks, you can continue to run all of your single-density software, then switch to double-density operation at any convenient time

Included with the PC card adapter is a TRSDOS* compatible double-density disk operating system, called DBLDOS^M, plus a CONVERT utility that converts files and programs from single-to double-density or double- to single-density format

Each DOUBLER also includes an on-card high-performance data separator circuit which ensures reliable disk read operation

The DOUBLER works with standard 35-, 40-. 77- and 80track drives rated for double-density operation

Note Opening the Expansion Interface to install the DOUBLER may void Tandy's limited 90-day warranty.

Drive enclosures, power supplies Percom drive enclosures are finished in compatible silver enamel. Three sizes accommodate either 1, 2 or 3 drives. Drive power supplies are heavy duty, cool-running open-frame design. Three-wire ac power cords are safer, have lower noise pickup

Free software patch This software patch, called PATCH PAKIM upgrades TRSDOS* for operation with improved 40- and 77track drives. For single-density operation only

Quality Percom products are available at authorized dealers. Call toll free 1-800-527-1592 for the address of your nearest dealer or to order directly from Percom. In Canada call 519-824-7041. Prices and specifications subject to change without notice.



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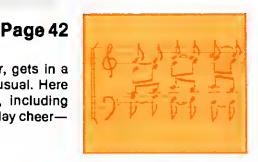
The Dvorak Keyboard Page 66

by Waldo T. Boyd and Jon Etherton

The latest in super efficient keyboards is 30 years old. Dvorak's scheme never caught on with manufacturers, but an innovative piece of software lets you program your own keyboard.

80 Applications by Dennis Bathory Kitsz

When Kitsz, the mad assembler, gets in a Christmas spirit, expect the unusual. Here you have his complete recipe, including parts, for creating your own holiday cheerin harmony.



Seasons Greetings Page 112 by Valerie Vann

Want to do something nitty for the holidays? Turn your 80 into a graphic decoration. Let your screen scroll snowflake and Christmas designs.

CAL81 by John F. Strazzarino

Create gifts for your friends with your 80. This program tells you how to make a gift that will keep you and your computer in mind all year round.



Page 132

Holiday Cheer by Normen S. Kerr

The last of our holiday packages to you lets your 80 send its own greeting cards. The program also maintains your card list throughout the year.

Page 128

Assemble it Yourself by Richard Koch

Page 212 Plumb the depths of your editor/assembler and let it modify itself. Prepare yourself for a bear! This program is a monster, so let us know if it's a wise use of space.

APPLICATION

- 109 The Office Computer Gary Valle Care and feeding instructions.
- 132 Hollday Cheer Normen S. Karr
 Better in your mallbox than your Wassall bowl.

GENERAL

- 86 The Dvorek Keyboard Waldo T. Boyd end Jon Etherton How come your keyboard's so awkward?
- 208 Turn-on Dr. J. H. Nastor
 Hate to hear the printer grumble and can't reach the switch? Change It!
- 280 Gregorian Converter Hubert C. Borrmann
 You may like Pope Gregory, but your 80 prefers Julius Ceesar.

HARDWARE

186 Joyetick City Larry Suter
Get the pleasure of smooth moves.

RECREATION

- 112 Seasons Greetings Valeria Vann Turn on your 80 and celebrate.
- 125 CAL81 John F. Strazzarino Keep your dates straight.
- 255 Compu-Sketch Mari J. Hendricks Video etching with your 80.

BEWIEW

102 STATS Robert P. Johnson The latest in statistical programs are compared.

TECHNIQUE

180 Now it's Time for...Name That Routine David Cornali A fabeling program that Indexes its own routines.

THEORY

147 Mysteries of the Level II ROM Victor Griswold Reveletions from within.

TWITORINAL

- 82 into the 80's, Part 4 lan R. Sinclair
 Tagging, dimensioning and further magic.
- 94 A Menipulstive Wizard John D. Adams Study the dark secrets of arrays.

WINDLINY

- 200 COMPAC Daniel M. Romanchik
 This article is not about assembling robots.
- 212 Assemble it Yourself
 If EDTASM Isn't enough, try this.
- 257 RESTORE Data Pointer Control Devid R. Cacil Point where you will.
- 259 Less is More C. E. Winterbauer Another mystery.
- 263 Keyword Liet Plus Jack Decker List your keywords and more.

DEPARTMENTS

- 8 Remarke Wayne Grean
- 10 Inside 80 Ed Juge
- 14 Input
- 20 80 Accountant Michael Tannanbaum
- 22 Education 80 Earl R. Sevege
- 24 The Assembly Line William Bardan
- 32 Reviews
- 42 80 Applications Dennis Bathory Kitsz
- 51 Newe
- 58 Producte
- 268 Annual Index
- 274 List of Advertisers

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META TECHNOLOGIES



MTC AIDS-III™

Introducing the latest addition to MTC's family of data management systems, AIDS-III NO PROGRAMMING easy to use COMPLETE PACKAGE including demonstration application, documentation and MAPS-III (see below).

- Up to 20 USER-DEFINED FIELDS of either numeric- or character-type.
- CHARACTER-type fields may be any length (total; up to 254 characters).
- NUMERIC type fields feature automatic formatting, rounding, decimal alignment and
- Full feature EDITING when adding or changing records:

ENTER FIELD (can't type-in more characters than specified)

BACKSPACE (delete last character typed)
DELETE FIELD contents.

RIGHT-JUSTIFY FIELD contents.
SKIP FIELD (to next or previous field).

RESTORE FIELD contents

SKIP RECORO (to next or previous record).

- SORTING of records is MACHINE CDDE assisted
 - 200 RECORDS (40 characters) in about 5 SECONDS

ANY COMBINATION of fields (including numerics) with each field in ascending or descending order

- · SELECTION of records for Loading, Updating, Deleting, Printing and Saving is MACHINE CODE assisted.
 - Specify up to 4 CRITERIA, each using one of 6 RELATIONAL COMPARISONS
 - LOAD or SAVE selected records using MULTIPLE FILES
 - Select records representing those people who live in the state of Colorado, but not in the city of Denver, whose last names begin with "F"
 - and whose incomes exceed \$9000.00. Select records representing those sales made to XYZ COMPANY that exceed \$25.00, between the dates 03/15 and 04/10. Example:

MAPS-III (MTC AIDS PRINT SUBSYSTEM), included at no charge, has the following features

- Full AIDS-III SELECTION capabilities.
- Prints user-specified fields DOWN THE PAGE
- · Prints user-specified fields in titled, columnar REPORT FORMAT, automatically generating column headings, paging and (optionally) indentation Can create a single report from MULTIPLE FILES
- Prints user defined formats for CUSTOM LABELS, custom forms, etc.

FOR MODEI

MTC is groud to announce MTC EXTENDED BASIC for the Model II, by R Ryen, Features include "fixes" to existing BASIC, multi-line functions, extending an existing sequential file, PEEK, PDKE, greatly enhanced screen control and expanded editing capabilities. The contents of variables are NOT CHANGED when editing, deleting, inserting or merging lines, allowing continued program execution! All this and much more. Compatible with SNAPP BASIC, below

MTC EXTENDED BASIC

MTC brings you the best of SNAPP, Inc.'s Model II BASIC interpreter at a very special introductory price. Written entirely in machine language, the enhancements are fully integrated into BASIC and require no user memory or disk space. Utilizes AP-PARAT's NEWDOS modifications to BASIC on the Model II Features include 16 single keystroke commands for editing, listing, and other opera-tions. An enhanced program line renumbering tacility supports relocation and duplication of blocks of code. Includes a powerful cross-reference capability for producing a list identifying program line locations of user specified variables and line numbers. Dutput may be displayed or printed. Compatible with MTC EXTENDED BASIC, above.

MTC AIDS CALCULATION SUBSYSTEM-III" MODEL I . . . \$24.95 MODEL II . . . \$39.95

MTC's most popular AIDS subsystem. Use tor report generation involving basic manipulation of numeric data. Features are:

- · User-specified page title
- Columnar Headings
- Optional Indentation
- · Use for accounting, inventory, financial other numeric-based information
- Columnar subtotals generated when there is a change in a user-specified column
- User-specified Columnar Totals
- Columnar values computed using constants and/or column values
- Balance forward calculations (Ex: Gross sales equals previous gross sales + sale amount + sales tax)

Compare AIDS-III™/CALCS-III™ with any other data management package under \$100! Others make claims, CALCS-III[™] delivers!

CALCS-III REQUIRES THE PURCHASE OF AIDS-III OR AIDS-II

MTC AIDS MERGE-III™

This subsystem will combine up to 14 AIDScreated data files into a single, large file. An optional purge capability removes duplicate entries while performing the merge operation (can even be used to eliminate duplicates in a single file). Machine-code assisted for high-speed performance, MERGE-HITM properly handles files sorted by any combination of fields, including numerics, with each field in ascending or descending order.

MTC AIDS MERGE-IIITM. \$19.95

MORE -



Let your TRS-80™ Teach You

ASSEMBLY LANGUAGE

REMSOFT's unique package, "INTRODUCTION TO TRS-80" ASSEMBLY PROGRAMMING" includes ten 45-minute lessons on audio cassettes, a display program for each lesson providing illustration & reinforcement, and a text book on TRS-80* Assembly Language Programming, Includes useful routines to access keyboard, video, printer and ROM. Requires 16K - Level II, Model I

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A complete checkup for your Model I, THE FLOP-A complete checkup for your Model I, THE FLOP-PY DOCTOR completely checks every sector of 35- or 40-track disk drives. Tests motor speed, head positioning, controller functions, status bits and provides complete error logging. THE MEMORY DIAGNOSTIC checks for proper write/read, refresh, executability and exclusivity of all address locations. Includes both diagnostics all address locations. Includes both diagnostics and complete instruction manual. SYSTEM DIAGNOSTICS \$19.95

6 · 80 Microcomputing, December 1980

MAKES EVERY BYTE COUNT

IN YOUR TRS-80™ MODEL I OR MODEL II DISK SYSTEM



September 17, 1980

Dear Meta Technologies,

Because of my work load, this is the first opportunity tha I have had to write you concerning the programs that I have purchased from your company. The programs; CALCS, SHRINK and SIFTER have purchased from your company. The programs; CALCS, SHRINK and SIFTER have paid for themselves 1000 times over. I was able to take a custom written billing program which we had paid \$2600 for and was able to condense it with SHRINK to about two-thirds of its original size! This was an incredible boon to my company as now I am able to fit several more utility programs on the same disk as the billing program. Just today I was able to adapt the 'SORTR' program in the series of sorts of SIFTER to work with our billing program. I believe that you understate the speed of this sort. In my experience, it is sorting over 500 records of 255 bytes in length in less than two seconds. As compared to the incredibly slow basic sort that I had in before, the 'SORTR' routine is just short of a miracle. Imagine having to wait over 45 minutes everytime a file of 500 records was accessed for sorting with the basic sort. If I had paid \$500 for just this sort alone, it would have been worth it, as that is the amount of money it will save my company in the next six months. Now I have another eleven sorts in addition to the 'SORTR' program to adapt. This program, SIFTER, is worth many times what you are currently charging.

CALCS has outdone a series of programs (AIDS III AND MAPS) that I didn't believe could get better. With the arithmetic manipulative qualities of CALCS I will be able to custom-write a total accounts payable/accounts receivable system. Not only that, but I am now able, using CALCS, to do saies, cost, and many other reports which require predicting arithmetically some future performance. Your program has completely revolutionized the paper-flow in my office. With the addition of NEWDOS+ I have an unbeatable software package. I can't thank you enough for the speed—and error-free performance of your programs.

WHAT NEXT META-TECH? How about revolutionizing the word-processing area? You have an eager customer waiting to buy. I have yet to use your REM-ASSEM system because of my work load, but from the little I have done with it I am very satisfied. If you come out with anything new, please contact me.

singurely. Walan

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80 REMARKS

"We're now renovating new editorial offices to accommodate the large staff that handles the publication."

The First Year of 80

with your help, this first year of 80 Microcomputing has turned out to be most successful. As far as I know, this is the first time any publisher has come out with a major magazine devoted to one single product.

It has been an interesting year for us. We're now renovating new editorial offices to eccommodate the large staff that handles the publication. It takes a lot of work to put out over 200 pages of magazine a month.

Has eny other technical magazine grown in less than one year to 125 pages of paid advertising? Certainly not in this field.

The alm of 80 hes been to support the TRS-80 computer. The editors are under threat of serious personal damage to make sure that as much of the meterial in the magazine as possible is edited from computerese into English so that new-comers to the field will be able to come up to speed easily. Authors are warned that English is preferred to computer buzzwords. We'll leave the egotistical computer scientist baloney to others.

If you have developed any programs for the TRS-80, think of submitting them for publication. If you've come up with any accessories or ways to interface various peripherals to the TRS-80, the rest of us would like to know about it. Write it up. Articles ere simple to submit; type them double speced with generous margins and use upper and lowercase letters. The better the illustrations, the better the article. All articles are paid for upon ecceptance, unlike some of the other publications.

My Short Editorials

Looking back over my editorials in 80, I see that most of them have been relatively short. Mercifully short, perhaps. Oider readers may remember John Campbell, who edited Analog for many years. Well, I was brought up on that magazine and I got used to the long, thought-provoking editorials John wrote, and so when I started my first monthly magazine, back in 1951, It never occurred to me to do anything but write long editorials.

John got to be a very good friend in the late 50s. There are few such brilliant men, so I was sorry to see him leave this world. But his influence lingers on in many ways, such as my editorials.

My writing reflects my many interests ...heck, if they interest me, why not you? I write about trips, visits to manufacturers, to stores around the world, to shows, about skin diving, skiing, ham radio, Mensa, sports cars, CB radio, radar detectors, music, and enything else thet heppens to seem of interest at the moment.

I do quite a bit of writing in our *Micro-computing industry* full of avuncular advice to the industry. Having called the turn of the coin several times with some accuracy, I occasionally get some respect, but not often. Move over Dangerfield.

I enjoy getting out end explaining to groups how they can make a success of their lives. It's so damned easy to be successful today, particularly in a field such as microcomputing where the whole industry is growing at an incredible rate. They and the country...and perhaps the world...would all benefit. Remember you don't bring benefits to a lot of others without benefitting yourself... and vice versa. This was the essential message of Adam Smith in the 1770s and it still holds

I also get ennoyed when I run across people who ere so damned docile that they will put up with burn laws just because they are laws. Have they forgotten that the Supreme Court hes been batting down laws wholesale for years? Maybe one person can't fight city hall, but a group of us can. Sometimes I get into trouble over this, and sometimes I win. I took on the FCC a few years ago and helped to bring about massive changes in the ham regulations. The ARRL (American Radio Relay League) said it couldn't be done...don't try. I said to hell with them and pulled it off.

Well, I just wanted you to know a little about me, now that we've been together for 12 months. Perhaps you see why I light into Radio Sheck every now and then. Sometimes I win a little. Sometimes not. They are almost as big as the government, and, in some weys, move about as fast.

Bad News for Software Houses

As Instant Software's distribution has grown, more and more smell software producers have been asking about using our system to distribute their programs. Indeed, we've tried this with a couple of the more aggressive firms.

In the record Industry, distribution has been consolidated by a few lerge firms. Smaller firms rely on them to distribute their records. The same thing has happened to magazine newsstend distribution; four or five large firms run the whole show. Perhaps we can learn from all that.

Instant Softwere has representatives covering the U.S. and 22 countries. Further, the size end number of progrems instent Software has in inventory enables us to talk directly to the major manufacturers of hardwere and make a far better deal than could a small firm with a handful of programs. You can bet that we are out there selling the idea.

We've given some thought to helping other smaller firms with their distribution, but I wonder if this is really the best option for a small software house. Let me go into some details on that.

Firstly, if we were to do just the distribution, this would leave the duplication, documentation, packaging and advertising up to the software house. Yet in every step of that progression, a larger firm is able to keep its costs lower.

Buying blank cassettes or disks, for Instance: Obviously sizable savings result from buying 100,000 or one million quantities. You can seve even more if you do your own tape loading. But such machines cost \$20,000 or so, putting it out of the reach of any but the largest houses.

Then comes the packaging. The design of a good package is expensive and has to be amortized over hundreds of thousands of packages. There is also the eutometic machinery needed for putting the tape and documentation in the package and sealing it.

Small firms have to make do with poly bags...ugh. High volume packaging is much less expensive, again making it difficult for the small firm to compete.



META TECHNOLOGIES

FOR YOUR DISK SYSTEM

FILE BOX

DISKETTE STORAGE SYSTEM

\$2495 for 5¹/₄" disks for 8" disks . . . \$29.95



MTC brings you the ULTIMATE diskette storage system, at an affordable price. 5toring 50 to 60 diskettes, this durable, smoke-colored acrylic unit provides easy access through the use of index dividers and adjustable tabs. Unique lid design provides dust-free protection and doubles as a carrying handle.

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(not shown)

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51/4-Inch diskette case						.\$3.25
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Single Sided, Single Density, Soft-Sectored 51/-inch, (for TRS-80TM) Mini-floppy

DISKETTES

\$1980 hox of 10

Meta Technologies strikes again . . . at the competition! These are factory fresh, absolutely first quality (no seconds!) mini-floppies. They are complete with envelopes, labels and write-protect tabs in a shrink-wrapped box.

INTRODUCING

PLAIN JANETM DISKETTES

The Beautiful Floppy with the Magnetic Personality™

In 1980 alone, MTC has sold nearly a third of a million dollars worth of brand-name diskettes. If anyone knows quality, we do. And these are quality diskettes. The catch? They are in a plain white box. You're not paying for fancy printing, fancy labels or fancy names on the packaging. We don't even put our own label on the package (labels cost money). At this introductory price (our regular price will be \$21.95 per box of 10) we cannot offer quantity or dealer discounts.

PLAIN JANETM Diskettes \$19.80 *

VERBATIM brand Diskettes (box of 10)

8-inch FLOPPIES Single-Density, F034-1000 ... \$29.95 Double-Density, F034-8000 ... \$39.95

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80 REMARKS

Documentation is a back breaker for ameli firms. Many solve the problem by having terrible instructions. A first rate product has to look good and have top-notch instructions. Even shipping is a problem for the smaller firm. To control its shipping, Instant Software has to warehouse all programs being distributed. We don't need the aggravation of having orders for something which is out of stock and over which we have little control. This means that smaller software houses will have to keep program packages in our warehouse, but at their expense.

Then comes the matter of advertising. This means the design and concept of the ad es well as its production. Once produced, the ad has to be run in the appropriate magazines. The more ed space you buy, the better the deal you get. Smeller firms pay a heavy premium for their small ads. And the worst part of this is that the larger the ads, the more response you get to them. There is just no justice...and no free lunch.

In every step e larger firm saves money. When you look at the situation closely, there isn't any step of the production and marketing of software that a larger firm can't do more economically then a smaller firm. If a smaller software house put more time into further programming, and left, not only distributing, but documentation, packaging and marketing to e larger firm, the net result should be far more real income. Instent Software, for example pays a royalty of 20 percent of its wholesale price to e programmer.

The day is not fer off when some major firm is going to want several hundred instant Software programs converted for their computer. One such bulk order can bring in a \$15,000 royalty check just for the initial order—even for a simple game program! A more sophisticated business program may bring in an initial royalty of \$40,000 or more.

You have me out there pushing hard for this type of sale for you.

Programmers who are already marketing their programs themselves have the option of submitting them to Instant Software, while continuing to sell the progrems themselves. There's never been any problem with this. Instant Software seks only that there be no errangements with any other third party software marketing firms. It takes several thousand dollars of investment before a new program package is ready to be marketed, so Instant Software wants to be sure that this is not going to be wasted by having the program come out from some third firm with a lower price. I hope that makes sense.

INSIDE 80 by Ed Juge, director of

computer merchandising, Tandy Radio Shack

couple of deys ago, I received a phone call from a Model I owner. He was in the process of developing a rather unusual application to be used on a large number of TRS-80s. The Model i didn't have the disk storage he needed, yet he couldn't justify the cost of a Model II. Model III appeared to be a perfect solution

Ouestion: Would his already-written BASIC softwere work? Since...uh... mmm...his programmer had disassembled TRSDOS and was using some "undocumented" DOS routine....

My answer? Be prepared for a re-write! Radio Shack did it to enother one... right? Wrong! The programmer did it to himself. Had he used only documented addresses, his program would have converted and run well on Model III. Addresses we don't publish, however, will change from one release of TRSDOS to the next (or in this case between Model I and III versions.) This is why we don't publish them!

The point of the story is—the programmer that has the savvy to pull such tricks (and there are lots of you), must have the foresight to enticipate the results. If the program is for your own use, no problem.

If you intend to sell the program tosomeone else...it could be a problem. Be sure it's understood what can happen if an attempt is made to use the program with a different release of either TRSDOS or our ROM.

Model III vs. Model I

Since I've indicated Model III TRSDOS is akin to Model I TRSDOS, let me explain. The ability to use Model I software on Model III does not mean that Model III is just a repackaged Model II It is a new design with some intentional similarities. We tried to respond to many of your suggestions...those cards & letters do work!

We kept the 16x64 screen format for compatibility, with the same high-resolution monitor as built into Model II. We included the Model I cassette format so that the large base of Model I software can still be used. Yet at the same time we've included a new, faster, more reliable 1,500-baud enelog cassette I/O system. We've given you a means of converting

Model I disk software to Model III format, but Model III uses fast 40-track double-density drives.

Our popular 12K Level II has grown into a 14K Model III BASIC. Model III's BREAK key returns control to you from any operation, even LPRINT with no printer, or a bad CLOAD?, and you won't lose the resident program. Every key has auto-repeat, and there's a keyboard-controlled screen print feature. Model III elso has a parellel printer port (so even Level i BASIC now has print commands). Model III BASIC includes the dual-speed cassette capability, a real-time clock, upper end lowercase drivers, a special graphics character set, and RS-232 I/O routines. You can define your own cursor character, blinking or non-blinking.

in your applications progrems, you can protect up to seven lines at the top of the screen from scrolling during input to the screen. There's even a ROUTE command to direct specified outputs between keyboard, display, printer, and RS-232 (send or receive).

By the way, there are 24 pages of ROM addresses in the manual.

Model III TRSDOS

The Model III TRSDOS is more like the Model II than Model I. The directory and free space map are pure Model II, as are many of the features and commands. There are ERROR and HELP commands for quick reference, a fast string sort, and a variable cross reference utility. You can even write end protect a diskette via software command. M III's DO file capability allows a string of automatic keyboard entries which allows you to powerup in your application program after entering the date. A CONVERT utility allows Model I disk programs to be moved to a Model III diskette, without disturbing the Model I diskette.

A variety of commands provides for a number of functions. For example, CREATE ellows pre-allocation of disk file space, DUAL duplicates output to video and printer, MASTER tells TRSDOS to always begin a disk search on a specified drive other than Drive 0.

There are also a series of CMD (x) commands, with different arguments serving a number of purposes. CMD(C), for exam-



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Twelve in-memory high-speed sorts for use in any BASIC program: stable, non-stable, with/without tags, for numeric or string data. Random File Sort included. Some sorts written in machine code. Includes sort subroutines, demo programs and instructions. Relocate as needed with REBUILD. Requires programming experience.

SHRINK.				٠							\$19.95
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Makes Every Byte Count! Make programs smaller and faster! Combines lines & removes unnecessary code including remarks, without altering program operation. Typically reduces program size 25% to 40%.

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A "must have" for the professional programmer or the serious amateur. Probably one of the greatest time-savers available. Write programs in shorthand - change variable names - generate program documentation - use with REBUILD and MINGLE to build new programs from old ones.

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Merge up to 14 files (Program or Data) into a single file. Data files may be merged in ascending or descending sequence with the ordering based on a user-specified comparison field. A very handy utility for consolidating data files.

"OTHER MYSTERIES" VOLUME II

H.C. PENNINGTON



Call now and place your order for this new book, "MICRDSOFTTM BASIC DECODED & OTHER MYSTERIES for the TRS-80TM", from IJG, Inc. A primer for cassette and disk BASIC on the TRS-80TM, the information provided applies to similar MICRDSOFTTM BASIC interpreters. Features include definition of terms, an overview of BASIC and DOS, explanation of exits, error codes, verb actions, "cold" and "warm" restart procedures and examination of system utilities, arithmetic support and 1/0 driver routines, and the communications region in RAM. Individual routines are explained in detail, with an index provided for easy access. Appendixes include tables for BASIC and DOS vectors, stacks and interrupt locations, PLUS thousands of comment lines for the complete MICRDSOFTTM BASIC.

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NEWDOS/80

by Apparat

Apparat's long-awaited successor to NEWDOS+ is here! This is not an enhanced version of NEWDOS, but a completely new product. Simplified DOS commands can be instantly executed from BASIC, even within a program, without disturbing the resident code. System options, such as password protection, number and type of disk drives, BREAK key enable/disable and lowercase modification recognition, can be quickly and easily changed. Five new random-access file types allow record lengths of up to 4096 bytes, and no FIELDing! A powerful CHAIN lacility allows keyboard INPUTs to be read from a disk file. An improved RENUMBER facility permits groups of statements to be relocated within program code. Diskettes may even be designated as RUN-ONLY! Features all NEWDOS+ utilities (SUPERZAP 3.0, etc.) and much more! One MTC technical staff memoral having NEWDOS/80 is "better than sex" (you'll have to judge for yoursel!!). Includes 180-page instruction manual and MTC QUE card.

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ple, compresses program lines by removing remarks, speces, or both (your option). CMD(L) loads a specified machine language routine to be called from BASIC, and CMD(O) sorts or alphabetizes the contents of an array to name just a few.

Of course, the physical differences reflect many of your suggestions, too. The one piece cabinet is capable of housing a Level I or If ROM, up to 48K RAM, RS-232, two of the four possible disk drives, and it's all fed by one power cable. To hold the non-disk price down, the add-on drive kif for drive 0 includes the controller and power supply for both internal drives. Again, the parallel printer port is built in, so we've eliminated the need for our ever-popular expansion interface with Model III.

You'll be heppy to know that every effort has been made in Model III to eliminate Radio Frequency Interference. I hope it's obvious that Model III, both in hardware end software is anything but a "warmed-over Model I."

We've Been Getting Questions

Q: Can my Model I be retrofit to Model III specifications?

A: Unfortunately, no. The hardware is too different.

O: Does the introduction of Model III mean that Model I will no longer be available?

A: As inevitable as death and taxes, the day will come when every product we make, even Model III and the pocket and color computers, will go. As of now, I honestly can't tell you when Model I will cease.

The real question behind this question is usually "Ami (Model I owner) now going to own a useless piece of outdated hardware? My enswer is an emphatic NOI Discontinuence, when it comes, won't change the benefits of your computer or its value.

Q: Is it true that Radio Sheck has been delivering 77-track double-density drives and just not telling anybody? If so, can Model I work with them?

A: All of our drives, from day one, have hed double-density heads. Earlier this year, we began to use drive mechanisms which were capable of 40 tracks, not 77. Those are the drives we seil today. They are taster, band positioner drives, and work well with either Model I or III. Our engineers tell us that Model I would not work reliably in a double-density mode. By the way, the earlier 26-1160's and 61's won't work with Model III.

Q: Is there a modification to eliminate RFI for Model I, especially for hem radio use?

A: No. We don't know of a reliable way

to eliminate RFI in existing Model I's. I've heard stories from people who heve killed 90 percent of the interference, but they also tell me that others have tried their methods (some quite involved), without any real improvement.

O: If I buy a Model III, cen I be essured satisfactory operation with my ham equipment, without Radio Frequency Interterence?

A: All computers generate some level of RFI and Model III like all of our computers, complies with FCC regulations. But it's our belief that the FCC tends to protect your neighbors—not you—from the computer. You may simply have to choose between computer operation and TV, harn radio, etc. I know RFI Isn't a pleasant situetion. I've spent a few nights on 20-meter CW with my unmodified Model I and M-80.

Visicale Comes To TRS-80

We began shipping Model I Visicalc software back in late September. Al-

"Q: Can my Model I be retrofit to Model III specifications? A. Unfortunately, no

though it was for Model I only, the plan was to heve a Model III version evailable in November. On the chance that some of you are not familiar with Visicalc, it's worth explanation. You'll find it one of the most versatile programs.

Picture a large spread sheet with up to 63 vertical columns labeled A, B, C, etc., and up to 256 horizontal rows labeled one, two, three... and so on. (There are a few restrictions depending on memory limits.) Visicalc turns your computer's memory limits such a sheet. Now, any location on the sheet (Al, AK211, O7, etc.) can contain a label or heading, or a number, or a formula telling the computer how to calculate the figure there. For example, A32 could be Net Profit, and could be A6 (Gross Profit) minus A30 (Total Expenses).

Now, the fun. If you went to do income projections for a year, enter your first month, then tell Visicalc to assume a 5 percent monthly increase in sales. You can handle fixed expense items by repeating those exact numbers for all 12 months. And when you're finished, when you enter or change a figure, Visicalc performs a bit of magic. The new numbers are

calculated end put into place immediately. Adding other variables is quick and easy. For exemple, what if you add a new employee, buy a new delivery truck, move into a less expensive office, start an expensive ad campaign, increase sales faster, have a sales slowdown?

Your bills can be adjusted for seasonal variations by entering a fixed amount or a reletionship to a base month.

Your video screen acts as a window on your spread sheet, and you can move the window enywhere. You can lock headings in place while scrolling, or even split the screen horizontally or vertically, scrolling only a portion of the display. Of course Visicalc can print specified portions of your spread sheet, or store it all on disk for later use. The possible uses are endiess.

Whether you're calculating the family budget, or doing corporate financial planning—if you own a TRS-80, Visicate would be an excellent addition. (Yes, Tandy's financial wizards have been using it for some time, too.) And yes egain, it will be available for the Model II in December if Murphy doesn't butt in.

The Management Computer

With the introduction of Visicalc, Scripsit, TRS-80 Videotex, and Profile, and especially with one-piece hardware like the Models II and III, businesses ere finding that the TRS-80 is a veluable management tool. It saves time and labor, manages date, does finencial planning, and even composes memos or letters. It also can provide a low-cost electronic mail service by means of Videotex softwere and the CompuServe Information Service. And best of ell, it's not just another future concept. It's all happening today.

If you haven't tried the CompuServe, you should. Our TRS-80 software packages include a free hour on the system. Your unique user number and password come right in the software package. There is no sign-up fee even if you decide to keep going after your free hour. Whether or not you find a home with CompuServe, the Videotex gives you en excellent general purpose communications package.

Visicalc, Scripsit, Profile end Videotex all make outstanding gifts for computer owners, end are almost universally usable regardless of the first use of the computer.

Also remember that cassettes, diskettes, and dust covers make outstanding low-cost gifts. But for you we at Radio Shack want to wish you, a happy holiday season and an outstanding 1981. We hope your stocking on Christmas morning comes stuffed with outstanding and unique computer gifts.



SNAPP II EXTENDED BASIC * family of the encountry to he

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EXTENDED BUILT IN **FUNCTIONS**

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"He was a first-class communicator
... I for one will not forget his
discussion of the appetite for the
miraculous in modern man."

Micro Millenium

When reviewing The Micro Millenium for your August Isaue, Nancy Robertson was clearly unaware that the author died suddenly before the book was published. This may well explain the deterioration she detects in the later chapters.

in addition to his qualifications as a psychologist, Christopher Evens was an applied computer scientist in the British 'boffin' tradition. His pioneering work on dialogs between microcomputers and naive users led to the development of the MICKEY system, in which an unattended microcomputer is used to gather medical information from patients. (On some sensitive topics, it seems that patients will give more accurate information to a sympethatic microcomputer than to a human doctor, and prefer to do so.)

He was also e first-class communicator of scientific developments to the non-scientist, combining a fielr for exposition with sturdy common sense. I for one will not forget his discussion of the appetite for the mireculous in modern man, culminating in e demonstration of spoon-bending as performed by Uri Geller, given in ewimming trunks during the lunch break in e symposium on 'Man-machine interaction' in Greece.

His was a rare combination of talents, and his death has left a gap that will not easily be filled.

Dr. Hugh David 91830 Le Coudray-Montceaux France

A Ham Writes

I heve never written to you before although as a Ham I have reed 73 Magazine for a number of years and now subscribe to 80 Microcomputing. In passing, I must say that I admire your style. You are one of my favorite curmudgeons. I use the term effectionately since I aspire to the same astate.

The reason for the letter is to tell you that the second issue of 80 Microcomput-

ing I received more than paid for several years' subscription. I was just about to disconnect my interface to drive to Nashville (35 miles) because of a problem that had developed between my TRS-80 and my H-14 printer. Both seemed to be operating well but the intormation the computer was sending wes printing out as garbage on the printer. The October issue came just as I was about to start pulling things apart, so naturally reading the magazine took precedence over flxing the computer. The Issue fell open to James Kunzman's article ebout the NEC Spinwriter end his problems with a warped RS-232-C board, To make a long story shorter. with a screw driver, a pair of tweezers, and a pencil eraser, I was able to fix my problem without a \$24 trip (plus mileage) to the Radio Shack repair center.

I hope you and your magazine live forever.

> Donald R. Goss, Chairman Division of Humanities Gallatin, TN

Bat Guano

I just received my fourth issue of 80 Microcomputing. The house rule here is that three back issues of any magazine remain; all others are tossed out. But 80 Microcomputing seems to contain so much information that I can't use it ell at once but must keep the megazines on file for a time when I can get around to it all.

After four issues, the quality of the information I'm keeping is coming strongly into doubt.

From the June issue, I patiently keyed in the "Life" listing. I realized in the process that something was wrong with the program, worked around it, and saw the corrections in the July Issue.

in the August Issue, I patiently keyed in the "Swords and Sorcery" program, again realizing that that program was screwed up, too. You can Jimmy a missing symbol in an assembly program, but It's hard to supply missing data in a BASIC program. These missing Items apparently had nothing to do with the programs themselves, but were just results of shoddy editing.

This month-September-I tried "Di-

vine Proportions," and found that the programming itself was downright shoddy—the parallelepiped, for example, was drewn wrong, and the option to print out the proportions clobbered the screen display. Again, if 80 Microcomputing's staff had checked out the program, this shouldn't heve happened. Another case of editorial irresponsibility.

80 Microcomputing also carries hardware modifications. I haven't tried any yet, but I have the feer that If I did, I might wind up with a smoking wreck instead of e microcomputer if the hardware modifications are as shoddily checked as the software that's published. OI' Madman Wayno can rip us off only so fer.

1001001? 101101—bat guano on your antenna.

Richard Arryx San Jose, CA

Richard, see previous letter.--Eds.

Article Argument

Your August 1980 Issue quoted and snidely commented on an erticle in the June 16, 1980 issue of Business Week wherein two Tandy VPs stated flatly that no new computers were coming out this year.

When I queried Radio Shack about the Item, they reported an Inability to find the quoted article in that Business Week. Nor could I. When I brought this to your attention, I was directed to the June 9, 1980 Issue of Business Week. But I came up dry there as well. No Interview, no article.

It looks from here that an apology is due the Tandy people. At the least, it is no way of healing the breach between your magazine and their advertising department.

> John R. McGinley, Jr. New York, NY

I suggest you read a little more closely before sending off your next letter to an editor. The first three paragraphs of the 80 piece you referred to are reprinted here.

"An article printed in Business Week,

June 16 stated that, "Over the next six weeks Tandy plans a barrage of new products to follow up its initial foray Into the small business market with its TRS-80 Model II."

"It goes on to say that a desktop computer for scientists and engineers, a word processor based on the Model II and small computers that will automate inventory controls are to be expected.

"At Tandy Corp., both H. L. Seigel, National Publicity and Promotion Manager, and Senior Vice President of Operations, Charles Phillips, deny the thrust of the Business Week article. They both say no new computers that they know of will be marketed by the company before the end of the year."

it is not the Business Waek article that quotes the two Tandy executives who denied knowledge of the new computers, it is 80 that quotes them. Business Week had the scoop. We tried to follow it up, without immediate success. The September cover story gave the details that would have been nice to have had in August.

The Buainess Week erticle is indeed in the June 16 issue on page 106J, entitled "Tandy's personal-computer salvo."

Nancy Robertson 80 News Editor

Disiikes Content

I'm sorry, but the time has come when I feel compelled to write regarding your current editorial content regarding "software pirates". Believe me, I do not condone this practice, but I feel you are using your publication, supported by my subscription fees, to promote a very self-serving, vested interest on your part as head of instant Software.

I subscribed to 80 Microcomputing because it was advertised as being the top of the line in publications dealing with the TRS-80, not because it was to degenerate into a soapbox for the slanted views of its publisher or to become saturated with advertising material.

As examples of the current state of your publication I cite the following:

In the last issue of 80 Microcomputing there were fourteen pages devoted to the softwere pirating on the copyright situation and one hundred twenty-five pages of advertising meterial.

These examples amount to the following percentages:

Pirate to TRS-80 material 6.2% of total contents
Advertising to TRS-80 material 55.3% of total contents
Total editorial/advertising 61.5% of total contents

As a businessman I realize advertising revenue and aditorial content are important parts of any publication, but after discounting some questionable material and still arriving at a total subscriber oriented magazine content of 38.5% of the 226 pages of your last issue, I honestly think you are putting the cart before the horse at the expense of your readers.

I for one would like to see you and your publisher friends get off your collective soapboxes and get back to the business at hend—publishing some top quality magazines dedicated to the top selling computer in the world—the TRS-80.

Vern H. Hall

Though we can't agree with your breakdown of editorial matter and are confused at your reasoning concerning articles covering software copyright or piracy— Wayne's editorials aside—we would like a chance to respond to criticism that our magazine is becoming more crowded with advertising.

Nowhere has the pressure to introduce more editorial matter in the magazine been more sharply felt than in our own offices. This pressure has not only come from upper management, but from our own sales department.

The editors are in complete agreement with these sentiments.

Perhaps, to a reader, our magazine's growth rate and the problems encountered are not self-evident. A publication which appeared in January 1980 at 147 pages and appears just one year later at over 250 has undergone radical changes. The editors have been chasing advertising space sales since February.

The more hectically we operate, the more difficult it is to guarantee both lucid and accurate articles; erticles which we hope depart from what passes as "technical" literature to become both educational and even enjoyable.

Only now are we properly staffed to do the necessary job. In the future we hope to offer yet a larger and more carefully edited magazine.—Eds.

Connector Advice

Radio Shack now sells a 40-pin card edge connector (Part 276-1558, on page 126 of their 1981 catalog) which they describe as "compatible with many microcomputers." While this connector fits the TRS-80 expansion port, from the back, the TRS-80 has the low numbers at the left, and the odd numbers on top of the printed circuit card. With the card edge connector

held so that the low numbers are at the left, the even numbers are at the top. This causes no problem if two card adge connectors are used on a single cable, but anyone who uses the connector to attach the TRS-80 to a circuit board should be aware that the wires will be ordered 2, 1, 4, 3,38, 37, 40, 39 and not in the usual sequence.

Sherman Levine White Plains, NY

Scripsit: Round?

Further to the letter in your September Issue from William O'Brien: I have now been using Scripsit for about three months, and am generally happy with it, but I am still bugged by the tack of line feed with the Enter key. I've become used to it and work around it, but it would be nice if it could be made to work.

I use my THS-80 with an IBM Selectric typewriter and Escon (USA) Interface unit. With this, the Enter key doesn't give a cerriage return unless there are several characters in the line. This means that such things as block formats and paragraph formats don't work.

You could say that I should have used a Tandy printer, but I won't buy that! For a start, in an office environment you must be able to produce typewriter quality printouts, and Tandy had not released their dalsy-wheel printer here at the time of writing. They have no other printer with the needed quality.

Also, for business correspondence you must have a number of other features, such as half line spacing, both for setting out and so you can write things like CO_2 or MC². You must be able to underline and you should be able to use all of the characters on the type ball, including $\frac{1}{4}$ and $\frac{1}{2}$. It is also nice to be able to correct small mistakes in the middle of the printed page, which you didn't see until you printed it out, using the typewriter's corrector ribbon. No printer can give you that with Scripsit—except the Selectric.

To get all of this you need either a dedicated word processor (at \$15,000 +) or a printer which doubles as a typewriter. This is what I have, and if I could just get it to execute a carriage return with the Enter key, I'd be happy.

Hope someone out there has had the same problem and solved it!

David D. Harris 470 Manon Rd. Plympton Park S. A. 5038 Australia





Needs Equipment

As you probably know, the Coast Guard Auxiliary is a nonprofit, volunteer organization whose primary purpose is to assist the Coast Guard. Here in the Caribbean, our group operates mainty in the area of Search and Rescue.

We have a considerable amount of information to assist us during SAR operations that is presently stored in files, books, boxes and on scraps of paper. When time is of the essence, we must rummage through all of this material to find the needed information. The suggestion has been made that ell of this data could be stored in a small computer.

Our problem, however, is that we do not have any government funding and all of our equipment is purchased by individual members. The purchase of a microcomputer would be out of the range of our people since most of us are retired and live on fixed income.

Is there any possibility of one of your readers donating a used or out-dated computer to our group? As a nonprofit organization, we are permitted to accept donations of this type and the donor would receive a favorable tax write-off.

It would be greatly appreciated if you could assist us in this matter.

Milton Greene - Vice Commander Coest Guard Auxiliery St. Croix Box 2759 - Christiansted St. Croix - USVI - 00820

Bi-Sync v. A-Sync

I have what appears to be an unsolvable problem which might be of interest to both you and my fellow readers and just possibly of enough potential to engender the development of a solution!

On the surface the situation seems simple: I operate a 32K TRS-80 with disk drives. With the R 232 board and a 300 baud R/S, modern communications with the outside world are a delight.

My corporate headquarters, on the

other hand, operates a monster IBM System 34, communicating with the world in 3741 protocol via 201C 2400 baud dial-up equipment.

Trouble is that the system 34 communicates in Bi-Sync. I need to communicate in A-Sync.

Short of spending upward of \$5,000, there appears to be no solution to my problem. Software packages are not available. Conversations with data communications companies who might act as an interface have proven either fruitless or way too expensive.

Any ideas??

Raymond L. Wetkins ICC Industries, Inc. Dover Chemicel Corp. Davis et 15th St. P.O. Box 40 Dover, OH 44622 to Level II, 16K.

Each morning that I intend to use the computer I first have to CLOAD a cassette titled Keyboard Debounce, Systems * KBFIX.

Without first loading this cassette i have to go through the throes of keyboard bounca (multiple printing).

I can't underetend why loading this KBFIX cassette will solve the keyboard bounce, but the repair shop tells me that the affliction (to the computer) cannot be repaired on a permanent basis internally.

Granted, loading this cassette consumes only a few minutes time and the computer performs beautifully after loading it. But I'm 63 years old and I like to put my time in more beneficially.

John V. Lane 14400 Astoria Street Sylmar, CA 91342

Scripsit Reboot Aid

Reference 80 Microcomputing for the month of July; there was a gentleman concerned with rebooting to DOS when using SCRIPSIT. Have no fear, if your system does reboot all you have to do is go to DEBUG and execute G6008. SCRIPSIT will come back with no loss of data. Do not try going to BASIC after reboot and enter by SYSTEM: Your data will be lost for sure.

There is also another answer to reading the directory when in SCRIP-SIT, and that is to buy NEWDOS 80 by APPARAT Inc. of Denver, Colorado. This is an excellent DOS system and allows you to read the directory without losing SCRIPSIT.

Chuck Gould Route 6 Box 6460 Nempa, ID 83651

Keyboard Bounce

I have a problem; but first a word of explanation.

I am a graduate mechanical engineer, I own a TRS-80, Model II with 16 K. This was originally a Model I, 4K which I have hed modified (by Redio Sheck)

DATEL Aid

I recently purchased a DATEL 30 Selectric based I/O terminal. I have been unable to find documentation and DATEL is now defunct. The terminal is EBCDIC encoded and I would like to convert it to ASCII. Any help in this conversion or documentation on the electromagnet driver board, power supply board, logic board, or the 50 pin connector between the logic and the typewriter would be greatly appreciated.

Bred M. Dickey 2806 Treehouse Pkwy Norcross, GA 30093

Needs Interface

My surplus Datel Selectric came with a software driver that works fine on programs, but it will not work with a word processor. I have tried both Pencil and Scripsit, and it will not print. Can anyone suggest an interface?

Paul Kalkstein Phillips Academy Andover, MA 01810



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Book Review

TRS-80 Disk & Other Mysteries by H. C. Pennington is an exciting title isn't it? Here, I thought, is a book that will tell sill about how the disk knows where to start and when to stop, how the system knows where all the pieces of a fragmented program are located, how a multiple disk system knows which drive to use. Perhaps it will give me hints on changing code on the disk so I can change the start-up process. This book promises to answer all my TRS-80 disk related questions.

The book starts out nicely enough; there is a short paragraph that says the TRS-80 is a pretty neat machine and Pennington loves it. Then there is a page about the crumbs in Fort Worth who are responsible for the existence of the TRS-80. We learn that the stupes who put TRSDOS together obviously didn't know what they were doing, but there are a pair of heros in Colorado who have saved the day for all us TRS-80 disk owners.

Most of the rest of this book tells us about the mistakes in Radio Shack's TRSDOS and the inadequacles of some of the other disk systems and how great NEWDOS is. We fearn that NEWDOS works and fixes all the mistakes. The book then describes how to use NEWDOS commands and features. The conclusion I drew is that the documentation with NEWDOS is inadequate and I have spent \$22.50 for an instruction book that I don't need. The title should have been Newdos & Other Mysteries.

John Grass Portoia Valley, CA

Sincleir Slips

After reading Mr. Sinciair's excellent erticle, "Into The 80's", I have found the following bugs:

1) The power switch does not perform a memory clear function during power-up. This is performed by the combination of a inverted input NOR gate, (Z53 & Z52), & the RC network, (R47 & C42). See R/S technical reference manual for details. Three poles of the four pole switch are used to switch the three power supply connections, (+5 & -5 vdc & vac).

2) When a reboot occurs, "Memory Size?" appears during program execution and you do not always lose the program in RAM. When it happens press the reset button first, then pull a list to see where your program went wrong. (By the wey, the explanation given by R/S of the function of the reset button is incorrect (L. if manual

pg. 1/2). Pressing reset returns the computer to "READY", not to "Memory Size?". Also you do not lose the program in RAM.)

The maximum characters per line allowed is 255, not 250.

4) On Print@ syntax, the comma should be used after the position argument, (PRINT@64,"...). This mistake was in the article, example 4 is correct.

5) This is not a bug but a method I have used to rid my keyboard of bbounce. Clean the contacts as R/S has recommended. Then paint the contacts with "Biue Stuff" or a similar product. Spray a small amount of the chemical into a paper cup, then dip a flat toothpick into the foam and gently paint the contacts. The chemical is a mild polishing formula which wipes the contacts each time they close. This chemical is used on TV tuners to keep the gold contacts clean.

John F. Costello Philadelphia, PA

POKE Convert

It seems that both Bertram Thiel ("Double Size Graphics", June 80) and Jeff Elsen (Input column, September 80) have neglected to mention that there are more ways to escape the 32 character mode than CHR\$(28) and CLS. I have found that POKEing 0 into memory location 16445

will effectively convert the video contents back to 64 characters per line and will leave the cursor where it is while CHR\$(28) brings it to position (0,0). If for some reason you don't want to use CHR\$(23) to enter the wide letter mode, POKE 16445,8 will do the same.

Benjamin Junge Los Angeles, CA

Dancing Numbers Program

>LIST 5 CLS 10 6 = 1 20 FOR X = 0 TO 895 STEP 6 30 PRINT@X, 6 40 NEXT X 50 8 = 8 + 1 60 FOR L = 0 TO 75 : NEXT L 70 IF 6 > 891 STOP 80 GOTO 20 READY

Try it just for fun!

I also would appreciate hearing from readers with programs helpful to the blind

John Rego Rt 2 Box 19 Logen, IA 51546

Continued to page 28



Math Flash Bugs

Corrected Lines for "Math Flash", Page 158, Sept 1980, 80 Microcomputing:

95 ON Y GOSUB 1000,1100,1200,1200,1400,1500,1600, 1700,1800

100 IF Y = 0 THEN GOSUS 1800 105 ON D GOSUS 2000,2100;W = 0;Y = 0

220 IF G C THEN PRINT @ 0,G;" IS WRONG, etc (Rest

of line remains unchanged).

Jim Berberello R.D. #1, Box 241N Tennent Rd. Englishtown, NJ

Machine Language Bug

Got a friendly cell from Neshville

Tenn, this PM from a Ham who was trying to make sense out of an article of mine in the August 80 Microcomputing, "Towards Machine Language". There was a foul-up in the printing on page 144. Under the heading Machine Code Listing, using T-BUG, punch in this series of commands starting at memory location 5000:

CD F6 04 3E 31 32 20 3E 76

The only nice part about composing room errors is that I find great numbers of folks out there who appreciate the effort that goes with authorship.

Allan S. Jotte W3KM 1005 Twining Road Dresher, PA 19025

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SOACCOUNTANT by Michael Tannenbaum C.P.A.

"While this may seem to be a lot of Mickey Mouse work, it is really sound data processing practice."

ecently I demonstrated the Radio Shack Payroll System for a client. After entering the data for several new employees, the program halted with a cryptic message OV ERROR IN LINE 1132. Covering my confusion with a humorous remark about Murphy's Laws, I listed the line.

The line contained a multipurpose routine used for both alphanumeric and numeric input, that determines the value of the input string. Unfortunately the input data contained an address 229 E 69th St. which the program had interpreted as 229 raised to the 69th power.

Of course I was able to make a quick fix (E became East) but the experience was quite distressing. If an inexperienced clerk had been operating the computer, he might have quit in disgust. Since the error occurred with the payroll master file open, the file could have been destroyed.

This type of bug is quite difficult to foresee. I am sure that future programs will correct this oversight and have procedures to facilitate an abort in case of an incorrigible error. However, this experience provides an important lesson.

A New Product

The Payrolt System is a new product. New data processing products, both hardware and software, are prone to strange and unanticipated errors. My experience has been that most new systems of any complexity require at least six months of field operation to purge bugs. For this reason an older software product supported by a reliable software house often offers the safest path to reliable automation of your business recordkeeping system.

One of the first microcomputer accounting packages was the Osborne System. This system was developed by Adam Osborne and Associates for the Wang 2200 in the mid '70s. Originally written in Wang extended BASIC, it has been converted by many vendors for both the Model I and Model II.

The system has been thoroughly field tested and documented in a series of published manuals. In the latest manuals, the Wang BASIC listing has been replaced by CBASIC listings. Many reputable software houses offer versions that

are guite low in cost.

The version that I tested was obtained from the Small Business Systems Group, Main St. and Lowell Rd., Dunstable, MA 01827. They have chosen to offer the system as a series of stand alone modules (accounts payable, general ledger, accounts receivable and payroll) or as an integrated Accounting Recordkeeping System.

Either method of application offers some advantages. In an integrated system each subsidiary recordkeeping module contains a program which prepares data for entry into the General Ledger program. At the end of each month, a special program generates general ledger information, eliminating hand journal entries.

Technically, an integrated system can eliminate close out journal entries that are required each month. This would increase accounting accuracy many times. By posting the recurring journal entries (for example depreciation, cost of sales and amortization) and financial reports can be prepared automatically.

Some Secrifice

Alas, nothing is obtained without sacrifice. The catch is that an integrated system must sacrifice disk capacity to contain all the programs and data files on one set of disks. The integrated system for the Model II only accommodates 400 receivable customers and 400 payable vendors. The General Ledger was limited to 200 accounts.

There is also a limit on the number of open transactions which can remain in the system. All limits can be doubled by using an additional disk. Fortunately receivable capacity—or the capacity of any other module— can be expanded at the expense of other modules. The Small Business Systems Group (SBSG) thoughtfully included the variable designations for file limits used in each subsystem.

With 34 programs and 13 files the integrated accounting system represents an outstanding value. All major functions are menu driven and it will be easily learned. In addition, an invoicing module is included to automate billing operations.

The package is supplied on two dual

density eight-inch diskettes with a 24-page description of the system and directions. Buyers are clearly directed to purchase the Osborne manuals. The system description is not intended to provide the detailed information that is available in the manuals.

All menus and functions are as specified in the Osborne manuals with the exception of the invoice module and the separation of the accounts payable and receivable main menus. All edit checking and data limit testing specified in the manuals are included. However, the job cost provisions of the original system have been eliminated.

The one new feature, invoicing, greatly extends the usefulness of the package. Designed as are the other modules, invoice data is entered into a transaction tile, where it can be altered by a file maintenance procedure. When all data is correct, an invoice printing routine is selected. An additional routine prints shipping labels.

Limited Capacity

The capacity of the transactions file is limited to 50 items. To purge it, the Accounts Receivable Update program must be run. It transfers the invoice totals to the Accounts Receivable transaction file, which does not update the receivable records directly. To accomplish this task the Accounts Receivable Update program itself must be run.

While this may seem to be a lot of Mickey Mouse work, it is really sound data processing practice. No file is updated directly in the Osborne System. All files are betch updated with hard copy control totals generated for each batch. This provides an independent audit trail which should be used to control the accuracy of the data retained in the system.

Unfortunately the use of a batch update procedure creates a potentially dangerous situation. In a batch system entered data is usually subject to adjustment. Entries should be pretotaled and totals balanced to the computer batch proof totals after entry. If the totals are out of balance, an adjustment can be made.

All modules in the Osborne system can



Give something different this season — the pleasing gift of increased memory — to your favorite TRS-80* user. The MT-32 from Microtek. The new, brilliantly designed Printer/Memory expansion module for the TRS-80 Model 1.

This unit will add 16K or 32K of RAM to the basic 16K machine without the expense of a full blown expansion interface. The module also contains circuitry to drive Microtek's MT-80P dot matrix printer or any other Centronics-compatible printer. No special software routines. No hardware modifications. Attaching or detaching takes seconds. One year warranty.

Three configurations are available:

- Without RAM assembled and tested (MT-32A @ \$119.50)
- With 16K RAM assembled and tested (MT-32B @ \$159.50)
- With 32K RAM assembled and tested (MT-32C @ \$199.50)

Available from Microtek or your nearest computer dealer.



9514 Chesapeake Drive San Diego, CA 92123 Tal. (714) 278-0633 TWX 910-335-1269 Outside California call toll frae: 800-854-1081

≥ 360

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adjust unentered transaction batches. It is quite possible, therefore, to transfer an invoice to the Accounts Receivable module and delete it or modify it before posting.

To guerd against this situation, the involcing module provides a series of hard copy reports which are generated when data is transferred.

Invoice deta entry has six different screen formats. The first screen format prepares the top portion of an invoice. The Accounts Receivable file provides a billing address, while shipping data must be entered manually.

A special file pre-defines up to 10 different types of payment terms which are selected by code when the heading is prepared. This should be adequate for most firms, in addition the same file includes information about the contents and size of the company's packing labels. This portion of the file is used to generate carton labels.

There is no provision to record sales by salespersons or their commissions. No doubt this could be added if required; there is no shortage of memory.

After completing the heading, a transaction entry screen is displayed. This screen allows up to 10 line items. However since the invoice cannot determine the accuracy of the item description and price. With larger disk space such an extension would be possible.

Separata Screens

Setting up a separate screen for each element of the invoice should facilitate the development of custom data entry modules for each business environment. In the test sample each detail data line provided for the following:

A 10 digit compound SKU/part number A 20 character part description Unit prices up to 999998.00 Quantities up to 9999.99 An automatic price times quantity extension

You can also include comments such as Partial Order or any other special notation in the body of the invoice.

After all detail lines are entered, an edit screen is presented. The operator may edit the details lines and enter sales tax codes and shipping charges. If the shipping charges are not available at this time, they can be bypassed and entered later. This option permits you to prepare e preliminary invoice.

The final invoicing screen allows the

operator to record or cancel the invoice. Options are also available to selectively alter the heading, detail line items and total—without requiring display of the other portions of the invoice.

The involcing procedures added by the SBSG to the Osborne system are well thought out. However, because invoicing and merchendise selection are labor intensive activities for most firms, I recom-

mend you customize this application. While this adds to the cost, the resulting labor savings can be significant.

I would like to thank those readers who have been sending "war" stories and letters of encouragement. It is good to hear from you. To those who have been critical about my Model II bias, I hope to review several Model I packages in the near future.

EDUCATION

by Earl R. Savage



well known quotation states: "There is nothing new under the sun." In spite of that, there are different ways to combine the known in order to accomplish new results. So, let's see what old things we can combine to overcome a couple of frequent problems in instructional programming.

A very common problem is limited memory. My correspondence with instructors around the country indicates that the typical TRS-80 setup has 16K of memory. More limited are the large number of 4K machines in schools and homes. Even a 16K memory can put severe restrictions on an instructional program.

Two Small Programs

The severity of the memory problem is dependent, of course, on the subject matter being taught and the level at which it is being presented. You might want to break up the progrem into two or more smaller ones which will fit the memory. This approach leeves something to be desired even when autometic CLOADing of the sequentiel programs is provided.

The second problem concerns learning styles. We all know that some students learn better by reading, others by listening, others by writing, and so on. It follows that a program designed for general use will be more effective if it provides for more than one learning style. The greater the number of learning styles for which a program makes provision, the more effective it will be.

One significant input to the student, overlooked in computer programming, is his auditory sense. Both in school and out, people have been learning for years by means of eudio tape recordings. Schools ere well stocked with cassette recorders and instructional tapes. Yet when they get en 80, it seems not to have oc-

curred to them to use the included cassette machine for audio instruction as well as computer programming.

This combination is particularly applicable to programs containing relatively large explanations. If that material requires no interection by the student, there is no point in using valuable RAM memory to contain it. Here's how it all fits together.

The computer program is written in the normal manner, except that long explanations are omitted. After the program is recorded on cassette, an appropriate series of voice recordings is put on the same cassette in the proper sequence. To use the program, the learner CLOADs the computer portion of the type. Then, he removes the computer plug from the earphone jack of the cassette machine. The student types RUN and the computer program begins as usual.

When commentary is needed, the computer turns on the cassette and the audio plays out of the speaker. As the program continues, the eudio is turned on and off.

Each word of the audio material saves several bytes of RAM which can be used for a treatment of a longer topic in the normal display interaction mode.

The Mechanics

The computer program and the audio may be put on the same cassette or on two different ones. The following instructions are presented as though a single cassette is used.

- In the introduction of the progrem, the students should be instructed to remove the computer plug from the earphone jack and to leave the cassette machine in the play position.
- At each point in the computer program where eudlo is needed, insert this line:



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Prince up push facts nexturaed . Circuit present

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EDUCATION 80

GOSUB6000

 Put this subroutine in any appropriate place in the program;

> 600 OUT 255,4 6010 PRINT @ 965, "AUOIO ON..."; 6020 IF INKEY\$ <> "G" THEN 6020 6030 PRINT @ 965, STRING\$(15.32); 6040 OUT 255.0 6050 RETURN

Each time program execution transfers to the subroutine, line 6000 starts the cassette motor. Line 6010 puts a message at the bottom of the screen and line 6020 stops execution of the program while the audio is playing. When the letter G is typed, execution falls through to line 6030 which removes the eudio message from the screen. Line 6040 stops the cassette motor and line 6050 transfers execution back to the main program.

- When you have finished writing and debugging your program, CSAVE it. Then, with the cassette mechine completely disconnected from the 80, record the audio segments in the appropriate sequence.
- The first audio segment should be concluded with words similar to these: "It is almost time to return to the other pert of the program. When you hear the beep tone, press the letter G on the keyboard. When the beep tone sounds, you should press the letter G for GO.....(BEEP)."
- Each subsequent audio portion should be ended similarly.
- The cassette will continue to run until the letter G is pressed. The space between your audio segments should be sufficient to allow time for the student to find and press the G.

Summary

This new combination of interactive progremming and recorded audio segments can be advantageous in many different applications. It works well in almost any type of formal or informal instructional program. The method can be used to list rules and conditions in game progrems. Business programs, too, often contain a considerable amount of explanetory material.

The computer/audio technique is great for pointing out the mejor facts ebout a chart on the screen, adding sound effects, putting sound and printed words together in the study of phonics, sound and notes in music and so on.

Give the computer/sudio program technique a try on your next project. You'll discover just how eesy it is to multiply your memory.

THE ASSEMBLY LINE

by William Barden, Jr.

n the early 60's, I attended an assembly language class which used a Scientific Deta Systems computer. One of my fellow students was asked to key in his version of a homework assignment from the control penal of the computer. The instructor then asked him if he was confident that the program would work. The student replied that it would work because the ERROR light on the control panal didn't come on as he entered the mechine language program.

These days we are all more sophisticated about program debugging than that. Debugging however, remains just about as tedious and frustrating as it wes then. In this column we'll take a look at the general technique of debugging assembly language programs, the debugging tools available and final testing of programs.

Using T-BUG

T-BUG is Radio Shack's cassette-based debug package. It provides rudimentary debugging functions, but can be used effectively to debug programs of any length. T-BUG normelly occupies RAM from location 4380H to 497FH. Many people heve relocated T-BUG to different memory erees by disessembling T-BUG, observing which instructions were non-relocatable and changing eddresses eccordingly. This was mostly done early in the TRS-80 game when there was only T-BUG and Small Systems Software RSM-1 available for debugging.

T-BUG can be put onto disk by relocating it to upper memory (ebove 6FFFH) and using the DUMP command of TRSDOS to write it out as a CIM (core image module). You'll probably want to use the disk DEBUG package instead, and I'll continue to assume so in the following discussion.

Let's essume that you have T-BUG on cassette or disk and went to debug an assembly lenguage program. First, get the object of your program and T-BUG into memory at the same time, by using the following procedure:

1 ORG your program et en area that does not conflict with T-BUG. Assemble it, check for errors, edit and reessemble if necessary and create an object tape on cassette.

2 Load the object tape you created by using the Level II monitor mode. Type

SYSTEM efter the > prompt of Level II and then type NAME efter the *? prompt of the monitor mode to load the object file. NAME is the name you used in assembling your program. If you did not use a name, NONAME is used as a dummy name.

3 Load T-BUG by typing TBUG after the *? prompt that follows a successful load of your object tape.

4 Type / ENTER after a successful load of T-BUG. You should now be In T-BUG as evidenced by a clearing of the left section of the screen and the # prompt.

An alternative to this is to load T-BUG and use it to key in the mechine language code for a program to an eres of memory. This is useful if you find a listing in 80 Microcomputing or elsewhere and don't want the agony of entering and essembling the source code. Make certain that the location of the progrem doesn't conflict with the T-BUG area, and, that all the code is there. T-BUG shines at rapid entry of machine language bytes; you can enter them as fast as you can type!

First Steps in Debugging

You've got your progrem and T-BUG in memory and ere in T-BUG. Much of your debugging should heve been done already! You should heve gone through your listing several times in detail end "desk-checked". Assembly language programming is not interactive; if you find errors, you'll have to edit, reassemble, and reload, and you'd like to keep that to eminimum.

Table 1 lists the T-BUG commands available. Basically, all you can do is examine memory locations end register contents, set breakpoints, end read and write cassette tape files.

Is it possible to debug effectively with such a limited number of commands? From my experience with T-BUG, DEBUG (disk), RSM (Small Systems Software), Z-BUG (MicroSoft's EDTASM-PLUS Debug), and a number of minicomputer end large computer debug packages (half of which seem to be named so that their initials spell out "DDT"), I would heve to say yes.

I would say that the time spent debugging a 1000-line program with T-BUG vs. the time spent with the most powerful de-

#8 aaaa Set breakpoint at hex location saak Fix" previous breakpoint. Use after breakpoint. #G Continue from breakpoint. #J aaaa Jump to hex location agaa. Load a T-BUO or SYSTEM tape. #М вааа Display location asaa. Enter new value it contents to be changed or simply ENTER IF OK. #P aaaa bbbb cccc NAME Write cassette from again through bbbh with starting address occurred file name NAME. Display registers X (after M, J, B, P) Exit operation. Table 1. T-BUG Commands

bugger would be no more than twice as long. One does not continually enter a stream of commands to the debug package—there's a lot of head scratching going on in between. The exception to this might be MicroSoft's Z-BUG, where editing and reassembling cen be done without reloading on an interactive basis, enabling efficient program development.

The procedure commonly used with any debug package is this: First, every programmer tries one run to see if by some miracle it works just as expected the first time. (It doesn't.)

Next, a search tor gross errors is done. This is not a systematic procedure, since there will probably be bugs popping out at you on execution. Use the B command to set a (B)reakpoint and then execute a J(ump) to the start of your program. The breakpoint is exactly that—the program will be executed until the breakpointed instruction is reached end then T-BUG will be re-entered. This gives the user control so the program doesn't bomb. If a program hang-up occurs, the program and T-BUG will have to be reloaded, or it may be possible to RESET the CPU and restart T-BUG at location 43A0H (by SYSTEM and 17312A.

T-BUG Implements the breakpoint by putting a CALL 4380H into the breakpoint location. This can have disastrous results (Fig. 1), where the 43H wipes out a variable used earlier!

When the breakpoint is reached, variables, buffers, or other memory locations can be examined for proper contents by using the M(emory) command to display memory locations. The R(egister) command displays register contents. The M command can modify any location by typing in a new value in hex.

One of the failings of T-BUG is that registers must be modified by altering memory locations associated with them.

The F(ix) command restores the original values to the breakpointed location. After the breakpoint is fixed, a G(o) can be used to continue from the breakpoint after a new breekpoint is established.

Binary Search for the Next Error

Debugging using T-BUG proceeds in this fashion: establishing one breakpoint at a time, reaching it, examining variables and buffers for proper results, and establishing a new breakpoint. The process evolves into a binary search for the next error—breakpoint halfway through, see if the breakpoint is reached. If not, establish one earlier, and so forth. This is not sophisticated debugging, but it works.

The P(unch) and L(oad) commands can be used to write end read in T-BUG cassette files. T-BUG files have a format identical to SYSTEM tapes produced by EDTASM. If you're working with a large assembly language program, it's convenient to patch and save the program on cas-

sette every so often. This way the patched program can be reloaded. Since T-BUG can be saved in the same tape file, a P(unch) command can produce one enormous file including the patched program and T-BUG; this can then be reloaded with a single SYSTEM command.

Petching

Patching is the process of deleting, modifying, or inserting machine code directly to the object or machine code in memory without reassembling. Here's an example: Suppose we want to add two instructions after PATCH in the program of Fig. 2. Obviously there's no room between the instructions (or little, anyway). The instructions are added to a patch area somewhere in memory and the code is modified as shown.

Here's a philosophical question—when should you patch and when should you reassemble? You should certainly patch if you are sharing a TRS-80 with 32 other programmers and you can't gat on the machine to reassemble for six days. You should certainly not patch if you are using EDTASM-PLUS with in-memory assembly capability.

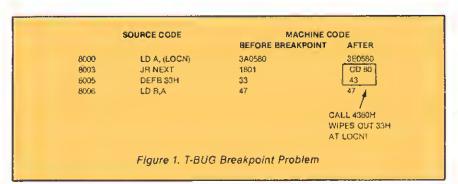
For all other conditions, you should patch whenever you find errors that can be corrected by modifying one instruction (such as changing the register in LD R1,R2), by deleting one or more instructions, or by inserting instructions. Reassemble whenever you have patches of more than a dozen or so.

To patch you must do some hand assembly of instructions. Another way to find the proper instruction configurations without manual assembly is to look through your listing to find identical or similar instructions for the patch. The patch area may be adjacent to the program, or it may be anywhere in RAM. If it is close to the program area, it is easier to include it in a P(unch) command.

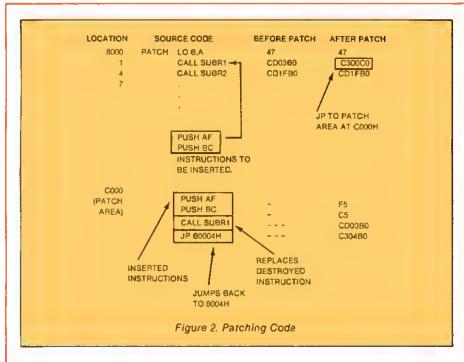
Ueing DEBUG

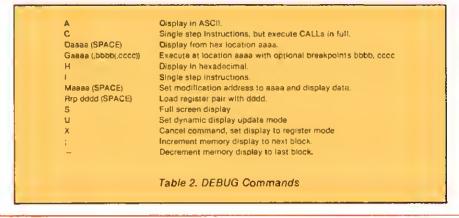
If you have a disk system the debug task is more convenient. DEBUG can be catled off disk. It loads into the system utility area. If you are using the Apparat EDTASM, MISOSYS EDTASM, or the Radio Shack Disk Assembler, source files can be saved on disk and object tiles written to disk. The latter feature makes it easy to reload the machine code for debugging purposes. The sequence for loading the object and transferring control to DEBUG goes like this:

1 After TRSDOS DOS READY, prepare DEBUG by typing DEBUG. TRSDOS will come back with DOS READY again.



THE ASSEMBLY LINE





2 Load the object module output by Apperat, MISOSYS, or the RS disk assembler by LOAD NAME.

3 Hit BREAK to enter DEBUG.

The DEBUG commands are shown in Table 2. DEBUG permits the same operations as T-BUG, but displays a acreen full of memory contents or a combination of memory and register contents. More than one breakpoint may be specified, which is a decided advantage as there is invariably more than one path through the program to be checked.

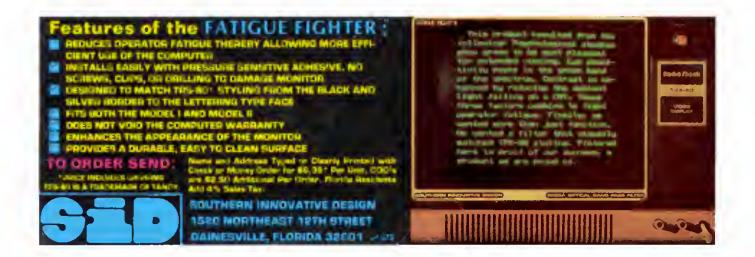
After each patch has been made, the petched core image can be written out to dlak by performing a G402D, which reboots TRSDOS, and then doing a DUMP NAME (START = X'aaaa', END = X'bbbb', TRA = X'cccc'). Be sure to include the patch area in the area to be DUMPed. The DUMP will create a new NAME file or replace the old NAME file which cen then be LOADed as before.

As with T-BUG, too many patches get confusing, and at some point it's best to do a new edit and reassembly.

DEBUG includes a command to singlestep instructions one et a tima. Singlestep through Level II or TRSDOS routinas to supplement information gleaned from disassemblies. Single-step can be also used to trace a path through your program to find out where a variable gets clobbered, or when an unexpected path is teken.

Small Systems Software RSM-2

Smell Systems Softwere was one of the first companies to bring out a significant piece of softwere for the TRS-80. Their RSM-2 and RSM-2D are upgraded versions





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of the original RSM-1 monitor, and they are powerful monitors. Monitor here is synonymous with debug package rather than the earlier meaning of control program or operating system.

The RSM-2 and RSM-2D packages contain commands to display and modify memory, to transfer control, and to breakpoint as in T-BUG and DEBUG. The packages also contain many other useful commands, such as FIND (search block for one byte), HUNT (search block for address value), MOVE (move one block to another), TEST MEMORY (random memory test), EXCHANGE (exchange two blocks of memory), ZERO (fill memory block with specified byte) and others.

The packages allow display of memory in ASCII or hex, printing of data to a parallel line printer (or to a serial printer through a serial interface), reading and writing SYSTEM tapes, reading and writing disk sectors (RSM-2D), and, for a grand finale, include a Z-80 disassembler for displaying code in mnemonics. When disassembling, none of the original comments from any code are printed!

A Zbignew Z-BUG Package

i don't want to keep harping about certain products—but after all, even I have a price (roughly equivalent to a box of diskettes)...The Microsoft EDTASM-PLUS, however, really is a superlative package. (Alas, it is cassette and not disk based). It includes a beefed-up Editor, Macro Assembler, and most importantly, the ability to assemble directly in memory. The last feature allows the debug portion of EDTASM-PLUS to be used on an interactive basis with the Editor and Assembler. The object code of a program can be debugged, and an immediate edit and reassembly can be done without reloading.

Z-BUG includes most of the features mentioned above, including disassembly and single stepping. Its single, most powerful feature operates in conjunction with in-memory assembly—symbolic debugging.

When an assembly is performed, the machine code is automatically assembled in the next available (or user specified) section of memory. At the same time, the assembler symbol table is preserved. This symbol table can be referenced by Z-BUG to examine memory locations symbolically. For example, you can type "TABLE!", and Z-BUG will search the symbol table for the location of TABLE, and then display its contents. Data can also be input in symbolic form—a location could be modified to the value LOOP + 5, for example.

Program Final Testing

The last step of the debugging process should be a comprehensive test of the final version of the program. A basic programming maxim is that programs never work the first time. Here's another: There is no final program!

Programs are released with bugs for two reasons. The first is in the nature of programs themselves. Programs are designed to provide generic solutions to many permutations of inputs and outputs. Not all permutations can be tested—there are simply too many possibilities. As a result, programmers pick representative inputs and outputs for testing. In the worst cases, a few runs are made through the program and the program is then pronounced "tested". In the best cases, a test plan is drawn up and the program is tested by a test driver. It's entirely possible that the final testing phase could take 25 percent of the total time spent developing the program! I'd like to recommend the programs of a company that does this comprehensive final testing, but they've unfortunately gone out of business...

Which leads us to the eecond reeson there are bugs in final versions of TRSDOS, NEWDOS, VTOS, Level H BASIC, and just about every other program. As every programmer working in a commercial environment knows, there is always a great deal of pressure to finish a program so that it can be sold. This holds true in TRS-80 software companies as well.

We'll just have to live with the bugs, ferret them out, and hope that the companies correct them. Meanwhile, make it a goal to do some final testing of your assembly language programs. End of sermon.

Still Another Model I Assembler

Roy Soltoff of MISOSYS sent me a copy of his MISOSYS Disk Mod. (I suspect he wanted me to use it, like it, and write about it in this column.)

The Disk Mod is a set of patches for RS EDTASM that converts it to a disk assembler with source and object file storage on disk. Other features I found handy were the ability to interface a serial printer, and page formatting. In short, this version of EDTASM contains all of the Apparat changes to EDTASM plus others. I've used this end I like It. (OK, Roy, you can send that box of diskettes).

Next month we'll have the results of the Third Assembly Line Programming Contest. (I'm getting the Amana ready for shipment to the winner now...



Continued from page 28

Printer Pagination

One of the less than desirable features of Radio Shack's Printer I with the roll paper is that there is no way to get page spacing when LLISTing a long program or printing a long calculation report. At least, there is nothing in the documentation to cover this.

Dr. Lien's "Learning BASIC II" tells us that the standard printer page length is 66 lines and that this quentity is stored at memory location 16424. Also, stored et location 16425 is the veriable that tells the computer how meny fines the printing head hes moved eway from the lest top of form positioning. The commend "LPRINT CHR\$(12)" moves the printing head to the next top of form and restores memory location 16425 to 0 to start recording the new page.

Try this little routine. Disk seve a long program (more then 100 lines) in ASCII—seve "BUDGER/BAS", A. Now it can be read and inputted as a sequential file. Now run this little program:

- 10 CLEAR 500
- 20 OPEN"I",1, "BUDGER/BAS"
- 30 FOR N = 1 TO N: N = YOUR NUMBER OF LINES
- 40 IF PEEK(16425) = 50 THEN LPRINTCHR\$(12) ELSE 50
- 50 LINEINPUT# 1, R\$
 60 LIPRINT R\$
- 70 NEXT N
- 80 CLOSE
- 90 LPRINT CHR\$(12)

There it is, your long printout is paginated and you can fold it or rip it into equal pages, side punch, and store in a binder. Many other things can be done with PEEK (16425)!

Richard Halloran San Francisco, CA

Qwikdisk

In your article in the September issue called QWIKDISK, the 09H and 19H numbers gives 12ms step times not 10ms. The 08H and 18H numbers also give only 12ms not 5ms step times.

This Information is based on Western Digital's data sheets for FD1771-01 Floppy Disk Formatter/Controller and my own experiments.

Eric Espenhahn Lake Park, FL

DUR CHRISTMAS GIFT

ALPHA GREEN SCREEN

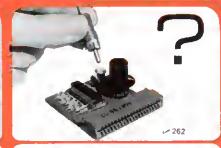
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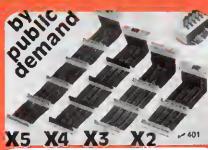
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WARNING

IBM and all the "biggies" are using green screen monitors. its advantages are now widely advertised. We leel that every TRS-80 user should enjoy the benefits it provides. But WARNING, all Green Screens are not created equal. Here is what we found.

"Several are just a flat piece of standard colored Lucite. The green lint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.

*Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobply film gives if a poor appearance

One l'optical litter lis in fact plain acrylic sherting
False claim. A few prefend to l'reduce glare. In fact, their flat and shiny surfaces (both lith and Lucite type) A00 their own reflections to the screen

 A lew laughs. One ad claims to "reduce screen contrast.
 Sorry gentleman but it's just the opposite. One of the Green. Screen's major benefits is to increase the contrast between the Text and the back ground

 Drawbacks Most are using adhesive strips to faster their screen to the monitor. This method makes it awkward to. remove for necessary periodical cleaning. All (except ours) are flat. Light pens will hot work reliably because of the big gap between the screen and the tube

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off fits right onto the picture tube like a skin because it is the

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The litter material that we use is just right, not too dark not too light. The result is a really eye pleasing display. We are so sure that you will never take your Green screen of

that we ofter an unconditional money back quatanty, try o Green Screen for 14 days. If for any reason you are not delighted with it return it for a prompt refund.

A last word. We think that companies, like ours, who are selling mainly by mail should wist their street address have a phone number (for questions and orders maccept CODs not every one likes to send checks to a PO bemofter the convenience of charging their purchase to major credit cards. How come we are the only green screen people doing it?

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OFFER EXPIRES 1/31/8





Edited by Pamela Petrakos

"A group of composers, with their ears tuned to the future, had developed musical techniques on early 'monster' computers, and an unfamiliar, disquieting kind of 'computer music' was born."



"1001 Things To Do With Your Personal Computer" Mark Sawusch TAB Books, Inc. Blue Ridge, PA \$12.95 Hardcover, 335 pp. \$7.95 Softcover

by Fred Blechman

robably the most ennoying question simed at computerists by non-computerists is, "OK, so what can you do with it?" Mark Sawusch addressed this question and came up with over 1000 answers!

Sawusch's 335 page book is an amazing collection of practical ideas and programs divided into 12 broad categories, and includes a glossary, appendix and index. Each category contains at least several, and as many as dozens of potential applications. A run through the chapter titles indicates the enormous scope of this book: Applications for Everyone, Business and Financial Applications, Technical and Scientific Applications, Educational Applications, Hobby Applications, Games and Recreational Applications, Control and Peripheral Applications, Artificial Intelligence and The Future Personel Computer, Utility Programs, Miscellaneous Applications and A Compendium of Additional Applications.

The four page glossary explains the meaning of common computer and programming terminology. The appendix covers financial formulas, gives addresses of 78 microcomputer manufacturers, contains a table of metric conversions and presents 11 flowcharting symbols.

All in all, this book is really overwhelming! Although it contains 75 actual programs (several running over four pages!), this book is not intended as a how-to book as much as a whet-to-do book. More than

1000 Ideas are offered, and covered in sufficient detail to provide a basis for a virtually unlimited number of spin-off ideas.

I was particularly impressed with the supporting information provided in many of the chapters. Simple formulas are used throughout, so you can easily develop your own programs by building on or altering the example programs provided. Diagrams, flowcharts and illustrations are sprinkled throughout. The type is large and easy to read and the program listings are in bold typeset—not hard to read reduced photocopies of matrix printing!

Although I couldn't find mention of the programming language anywhere in the text, it appears that all programs are Radio Shack TRS-80 Level II BASIC, with some progrems designed for disk use. This means they can be adapted to the majority of microcomputers that use Microsoft BASIC. There are no machine language or assembly language programs included.

My criticisms of this book are in the programs and listings. Some programs are very long, yet no indication of memory requirements are given. It appears that some would exceed 16K, and sometimes a program that looks short uses extensive string or array space. I would like to see each program with a REM line indicating memory needed, and whether the program can be used without disk.

Also, because each of the programs has been typeset rather than photocopied from an actual listing, there are numerous typesetting errors. This, together with the fact that the author has made no attempt to explain the line by line operation of the programs, and has not listed the variables and their usage, makes this a book too advanced for beginners. While a beginner could certainly key in and RUN the programs, the main thrust of the book is to stimulate ideas for those already familiar with BASIC programming.

My hat is off to Mark Sawusch for the effort and imagination he used writing this extremely stimulating book. If you are into BASIC programming, you'll probably find enough ideas and examples here to keep you and your computer busy for 01100100 binary years!

An Introduction to Computer Music Wayne Bateman John Wiley & Sone, Inc. New York, NY Hardcover, 314 pp. \$24.95

by Dennis Bathory Kitsz

omewhere, a mechanical voice sings "Dalsy, Daisy, give me your answer true." Some time ago, an enthusiastic high school science teacher played us an experimental recording of that song, and, with half chuckle, half sigh, acclaimed it a portent of things to come.

A group of composers, with their ears tuned to the future, had developed musical techniques on early "monster" computers, and an unfamiliar, disquieting kind of "computer music" was born.

But those were the days when robots were imminent; George Orwell's 1984 was

hardly a decade old. The experiments in computer music conducted by Lejaran Hiller and others were viewed with a hostility interbred with fear.

Renewed Interest

The appearance of An Introduction to Computer Music by Wayne Bateman heralds a renewed Interest in the genre.

The real 1984 is now in sight. An Orwellian cataclysm seems nearly as quaint as the predictive fictions of Jules Verne and H. G. Wells.

Maxwell House coffee jingles have brought this musical electronic sound to the public. Robert Moog's "music synthesizer" has made his name as familiar as Kleenex. No amateur band was complete without one; computer music composers were forced to retreat to the safety of the universities.

The production of music generation peripherals for the TRS-80 and other person-

al computers demonstrates that many composers other then academics are now enthused about sound and music creeted with the aid of digital circuits.

Computer music is not merely electronic music, though, but rather a very versatile technique of composing and orchestrating sound and structure beyond that normally available to humans.

In general, electronic music is any sort of deliberate sound created or mutated by electronic means, issuing from a loudspeaker. In classical terms, electronic music can be divided into three overlapping areas:

- Concrete music: The original music is acoustic, meaning it is produced without electronic help. Then, that sound is transformed by electronic circuitry.
- Synthesized music: Many musicians object to this term, claiming that all music is real, not synthetic (in fact, I call my own synthesizer en "electronic music developer" to get away from that artificial music term). But the phrase can be generally defined as eny music originated by electronic means and processed through traditional audio circuitry (oscillators, filters, reverberators).
- Computer music: This music is generated, manipulated and controlled by a computer. Normally, only the final presentation to the listener involves any enalog (audio) circuitry.

Bateman's book deals exclusively with computer music. The book is neither academically thorough nor popular, occupying a dangerous middle ground in which Betemen is not entirely comfortable. Bateman is a lucid writer, but the topic is too big. Introduction leaves us confounded by detail.

The question of the computer's validity as a musical device is briefly discussed in the first chapter. Bateman believes in that validity, and presents the physical and mathematical fundamentals of its tones and their harmonics. Frequency spectra, additive and subtractive synthesis of complax tones, sampling intervals and phase relationships are presented. These topics are complex, but vital to computer composition, so Bateman includes a formidable but inevitable helping of mathematics.

Two unsetisfying chepters on computer operation and languages follow. (Bateman's machine has the unnerving habit of giving its accumulator a compllment, rather than complementing it.) These chapters present flow charts and theoretical programs in FORTRAN, Pascal and "English." BASIC program samples are in the appendix. The author does not tell what

machinery to use to test his theoretical programs, on the assumption that the hardware (but not the software!) might become outmoded. This leaves the reader unclear on how to "plug in" to the computer.

Waveform Analysis

Successive topics include modulation (not musicel, but sonic), dynamics and waveform analysis. The chapters contain a great number of graphs representing sonic events. The waveform analysis chapter is Bateman at his best, but even the experienced composer/programmar winces at the convoluted waveforms of obce and clarinet, for which separate charts are presented for each of the first twenty-one partials!

Bateman describes the computer's synthesis of complex tones—sounds which cannot be created by sounding objects, but are the results of waveforms, manipulated and reformed, within the composer's mind.

He asserts that this changes the way a composer will create new works of art. "Here, the composer is in direct control of the timbral quality of all the sounds in the composition. Consequently, he or she must understand the fundamental constitution of these sounds and the principles governing the methods of their production. This is why extensive study of acoustics and waveform analysis must now take a prominent place in music theory as the electronic medium is brought into the art."

The text discusses recorded and natural sounds, proposing a difference in approach between the more common enalog processing and the difficult but potentially more accurate and reproducible method of sound generation with a computer.

Finally comes the art: Scales and tonality are presented with a lucidity and depth of understanding surprising and gratifying. Obviously, Bateman is at home with contemporary Western music and its long history, and his tone and selected musical examples are both to the point and refreshing.

Bateman has included a probing discussion of the dilemmas of the computer in modern society, "Machines and Human Creativity." Bateman speaks of the personification of machines this way: "Anyone who programs a computer quickly becomes accustomed to its cold, mechanistic responses to every instruction, and to its banaf incapability of humanistic interaction." Brevo for Bateman.

Introduction to Computer Music remains an unsatisfying work. It is because personal computer users are given no hint on how to begin the task of composition. Because it seems mathematically detailed, the book can be overwhelming. Also it assumes some knowledge of music theory, and is not directed to the growth of the extemporizing composer/performer. But, the book does present a topic returned from public banishment, and deserves the attention of composers and other musicians, as well as computer hobbylsts.

KEEPIT Varsion 2.0 Dennis Bethory Kitez The Alternate Source (TAS) Lansing, MI \$9.95

by Jack Decker

any folks have purchased the TRS-80 Model I in expectation of using it for serious applications only to discover the limitations of the cassette-based system. For those unable to justify the added expense of moving up to disk operation, there is now available a very underrated program that could make serious applications on the Model I a whole lot easier.

Written by Dennis Kitsz (a name that should be familiar to 80 Microcomputing readers), KEEPiT is a utility program that packs a lot of power into less than 1K of machine code.

Several Faatures

KEEPIT has several features. First is the inclusion of the KBEEPFIX routine which initially appeared in 80 Microcomputing (February, 1980, pages 14 and 15, also see the update which appeared in the column on pages eight and nine in April, 1980). This routine provides keyboard debounce, automatic character repeat (after a short delay) when a key is held depressed, and an audible beep at the cassette output port each time a keystroke is entered.

Useful as that may be, the next feature



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is the real workhorse of the program because it allows BASIC programs to be saved in the middle of a RUN with all its variables intact.

Here's how it works: At whatever point you want to save your program, you press BREAK. Set up a cassette to record the program, then type the command:

"SAVE/RUN"PROGRM"

(The asterisk is the cue for the KEEPIT program to take over from BASIC and interpret the following commands.) "PROGRM" may be replaced by any file name of up to six characters.

When you want to retrieve your program, hit ENTER for the MEMORY SIZE?, and ready the cessette recorder. Enter SYSTEM, then enter the file name. The

tape will load, and the program will reappear exactly the way you saved it.

What happens is: The BASIC program is re-loaded, along with all variables, systems pointers, the KEEPIT program itself; even the video display is restored just as it was. Only "free space" (memory not used during execution of the program) will not be affected. You simply CONTinue your BASIC program right where you left off!

Such a feature can be used to debug new programs by saving a program at various points throughout a run, thus allowing you to go back and reconstruct what was happening in the logic flow of the program just before the crash. "Epic" game players will find it handy to be able to save a game in progress and return to it at their convenience. (KEEPIT does louse up the

current screen display a bit, however this may not be applicable to all games.)

I think its most practical epplication will be to maintain data in array variables within the BASIC program, and output it to tape along with the program.

As an example of the latter, consider a short program to save ten names and phone numbers to be displayed later on the video. A simple save program might look like this:

10 FOR X = 1 TO 10

20 INPUT NS.PS

30 PRINT #- 1,NS,P\$

40 NEXT

Later on, when you want to read the data, you can use this program:

10 CLS: FOR X = 1 TO 10

20 INPUT # - 1,NS,PS

30 PRINT NS.PS

40 NEXT

Or, using KEEPIT you can do this:

10 FOR X = 1 TO 10

20 INPUT N\$(X),P\$(X)

30 NEXT

40 CLS: STOP 50 CLS, FOR X = 1 TO 10

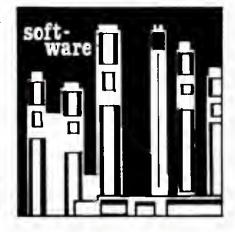
60 PRINT NS(X),PS(X)

70 NEXT

When the program stops at line 40 (after all entries have been made), you could type:

"SAVE/RUN"PHONE"

Later you can load "PHONE" as a SYS-TEM tape and CONTinue. Notice that this saves you the trouble of loading the program and the data in separate segments, and it saves you the time required to execute several PRINT # – 1 and INPUT # – 1 statements. When large amounts of data are involved, this can be a real time-saver.



Disk*Mod MISOSYS Alexandrie, VA \$20

by Buzz Gorsky

hen I recently acquired my disk system, I began looking for a utility that would make my Redlo Shack Editor! Assembler more useful. I had lots of assembly language programs on tape, many of which required editing to make the machine code compatible with the disk system. The thought of having to enter them ageln into a disk-based system such as Radio Shack's \$99 disk EDTASM package was not appealing. When I saw an ad for the MISOSYS Disk*Mod program, I decided to give it a try.

Easy Data I/O

The tape came promptly, with readable instructions and answers to some questions I had submitted with my order. These questions would have been answered in the Instructions, but the MISOSYS folks wrote out the answers anyway.

I had some trouble loading the tape; I tried to load it with SYSTEM in Disk BASIC and it wouldn't load. I assumed that DISKMOD was the program's Identifier, but a little reading showed that it loads as DSKMOD. Once I got it loaded, it always produced disk errors during execution. I put the program on disk with TAPEDISK, as suggested in the MISOSYS directions. When the program ran from disk, it worked fine, picking up my copy of the EDTASM and putting it on disk.

Since I've had the program on disk, I've enjoyed using it very much. It permits easy input and output of data (assembly text or object code) to either tape or disk.

Disk*Mod provides prompts where filespecs are required. Anyone familiar with EDTASM will find this easy to use.

There are some nice additions to these features. While in the program, you can get a disk directory which shows the memory usage of each disk file, and you can kill files on the disk. You can see how much memory the current program is using, as well es how much text buffer is left. When you exit the program, you can go to DOS automatically, or you can specify any destination address.

Debugging

When reentering the program, you can enter a hex address to protect an area in high memory where there might be a printer driver or other program.

By entering a 0 you can get back into the program, without destroying what was in the buffer when the program was exited, as long as other operations did not overwrite the buffer area while out of the program. This feature makes debugging nearly painless, since you can save source and object codes on disk: Exit, use DEBUG and come back. If when working with the program DEBUG did not overwrite the butter, you're back in business. If the buffer was ruined, it can be emptied and the saved program entered from disk. Tape users will find this quite different from the sequence required for debugging with a tape-based system.

I found only one problem with the adapted program. It doesn't handle some assembly text errors well. When I had a statement that wasn't in correct format, that line and the next several lines printed erretically and illegibly, but the error wasn't pointed out. It the print during assembly starts to look strange, took for errors and you can fix the program and the print at the same time.



Execute from Within

You may be wondering if you can execute the *SAVE/RUN command from within the program. It is possible, but it will be the last statement executed in the program, and you must use caution, if you replace the STOP in line 40 of the above program with *SAVE/RUN"PHONE", as long as the recorder has been properly preset to record, the program will record on tape just as if the statement had been typed from the keyboard. However, you will be unable to CONTinue the program. GOTO 50 will work OK (don't RUN 50 as that would clear the variables!). Another point to note is that in certain circumstances a colon may be required before the asterisk, for example, the statement:

IF X = 10 THEN "SAVE/RUN"PROGRM"

will generate a syntax error, but:

IF X = 10 THEN: "SAVE/RUN"PROGRM"

will work just fine.

Another feature of KEEPIT is the machine code monitor. Typing:

*OPEN"NNNN"

where NNNN is replaced by an address in hexadecimal, displays 16 bytes of memory beginning with the specified address. The bytes are displayed in hex with their associated ASCII characters displayed on the next line.

Typing a two-digit hex code will change the teftmost byte of the series; the entire series is then incremented by one. The series of 16 bytes can be incremented or decremented one byte at a time, without changing any bytes, by holding down the left or right arrow keys. You can move 16 bytes at a time by using the up or down arrow keys. Lest you get confused, the address of the leftmost byte of the series will always be displayed in the upper left-hand corner of the video display.

Once you have typed a machine language program using the monitor, you may BREAK and seve it to tape by using the command:

"SAVE/OPEN "PROGRM,NNNN,NNNN,NNNN"

where PROGRM is replaced by the program file name and the NNNN's are replaced by the start, end and entry points of the block of machine code to be saved. The resulting tape can be loaded under the SYSTEM command.

The final command, *NEW, restores a

BASIC program that has been wiped out accidentally by typing NEW.

KEEPIT is supplied on cassette with both the SYSTEM (object) program and the editor-assembler format source code. This is not the usual case with programs of this type but should be encouraged, since it makes user modification of the program much easier, and also makes it possible to relocate the program anywhere in memory. (KEEPIT is normally supplied with 4K, 16K, 32K, and 48K versions on the tape—these will load at the top of available memory.)

I was unhappy with the delay loop for

the KBEEPFIX routine auto-repeat feature. I tend to leave my fingers resting on the keys, which resulted in unwanted repeats of the last key depressed. With the source code provided, I was able to lengthen the delay to an amount of time more to my liking.

KEEPIT is compatible with other special-command routines (such as the Exatron Stringy-Floppy routines). If you don't have a disk system, KEEPIT may prove to be one of the most useful utilities you own, especially if you use it to eliminate some of those time-consuming PRINT # − 1 and INPUT # − 1 statements. ■

ISAR (Information Storage and Ratrieval) The Alternate Source (TAS) Lansing Mi \$17 on disk

by R. Louis Zeppa

or my out-of-print book business I needed an inexpensive method that would help me create book lists. Compiling catalogs by hand and typewriter is slow and prone to error. By this method books are listed on 3×5 cards, sorted, and then the list is typed—a minimum of three steps for each book. Catalogs of 200 to 300 books have taken up to a month to prepare.

With ISAR, I completed two separate 500+ entry catalogs in three days each. First I entered the book citations directly and then let the computer sort and type the catalogs.

ISAR is made up of modules, of which there are ten. Module 1 is the driver or menu module. The basic ISAR includes six more modules: create a file (2), add records (3), change or delete records (4), sort (5), screen scan or search (6), and format hardcopy reports (7). All processing focuses through module 1, that is, you cannot add records and then jump directly to change records. The file name must be entered each time you pass through module 1, thus it is possible to enter the file name more times than is reasonably necessary.

ISAR does have some problems. It cannot add, delete, or modify entries during the same pass through a file. ISAR's sort is frustrating because its printout formats entries but not pages.

Taken singly, none of these is a major deficiency. However, these little quirks can be irritating. For example, you must make two passes through a file to delete and change records. This is because it is

the same module and after, for example, deleting, instead of bouncing back to ask if you want to change some records in the same file, ISAR asks if there is another file you wish to delete items from.

Another limitation is that ISAR won't do a multiple field sort. Yet with proper coding and planning it can be simulated. For example, sorting a mail list first by name and then by zip code will produce a list sorted alphabetically by name within each zip code.

There is yet another shortcoming with ISAR—it has an in-memory sort. A file with many records will overwhelm memory if the field being sorted is longer than 18 characters. Although the sort is fest, a slower disk sort would be more flexible.

When reports are formatted for hardcopy, you must sort out deleted items or they show up as skipped lines in the printout. There are more hardcopy problems, but space must cut this critical list short.

You must bend, beat, and squeeze your work into ISAR's limitations. If the manual was accurate and referred to specific lines in the modules, ISAR could be relatively easily modified to suit your own needs. It would still be limited, however.

TAS is committed to improving ISAR with new modules. Extensions to ISAR which are set up in the same way as the add-change-delete functions will continue to hinder its easy usefulness.

For the occasional user who won't do a lot of file manipulation, ISAR with be very useful, at a good price and, to be fair, ISAR is not advertised as a solution to business or bibliographic problems. It was "originally designed to provide personal users with a low cost data management system." As critical as I am, it has proven valuable, but for large and potentially complicated files, ISAR is too difficult. In this case, my advice would be: Spend more money for a more flexible progrem.



These Next 4 Pages are for TRS-80* Owners ONLY!

The next 4 pages contain over 100 programs for your TRS-80. Whatever your interests, we have a software program for you. We list sections on Home/Personal, Business, Games, the Arts, Home Education, Utilities, Special Business, Flight Simulations, Electronics, Comp-U-Novels, and Popular Games. These programs can be purchased through your local Instant Software dealer, or you can call us directly using our toll free number. We ship our orders the same day we receive them. Browse through these 4 pages, we're sure you'll enjoy your selections. Remember: WE GUARANTEE IT!

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a selected BASIC function word (e.g., INPUT, PRINT) is used. (T1) Order No. 0203R

TLDIS & DLOIS-These two utilities are ideal for those who wish to decipher and/or modify machine-code programs. TLDIS (Tape-besed Labeling DISassembler) and DLDIS (Disk-besed Labeling DISassembler) are three-pass, tabel-assigning disassem blers that assign labels (where appropriate) to the routines in a machine-language program. Their output is almost identical to that of a hand-assambled source code. TLDIS can seno the disaseembly to cassette tape. OLDIS can send it to disk; both send it to the video monitor. Each version can be reassembled using Tandy's EDTASM or Apperat's disk extension of EQTASM, respectively. You can also send either disessembly to a printer (R/S parallel port). Because of the labels, it is a simple matter to change any object code program by diseasembling it and making changes to the resulting source code, without losing track of the jump/load addresses. Labels start at "AA00" and increment up, in even numbered steps (AA02, AA04, etc.). The odd numbers (AA01, AA03, etc.) are left for your (optional) use in the reassembly. TLDIS (T1) Order No. 0230R \$14.95. DLDIS (T2) Order No. 0231RD \$19.95.

TNE DISASSEMBLER—This is a singlepess, hex-notation that sends its output either to tape or to a lineprinter (R/S parallal port). The tape output is directly compatible with Tandy's EDTASM, so you can disassemble an object code tape and output it to tape, then use EDTASM to add, delete, change and re-essemble your new version. It displeys the displacement and absolute address of any relative jumps made by the disassembled program. It also displays and ASCII characters used in an LD or CP opcode. It is relocatable and you can jump to memory locations and transfer control between Disassembler end other utility programs. (T1) Order No. 0239R \$9.95.

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CARDS—A one-player package to let you play, with your computer, these famous games: a DRAW AND STUD POKER: These programs will keep your game sharp; • NO-TRUMP 6RIDGE: Develop your strategy and (hopefully) increase your skill. (T1) Order No. 0063R \$7.95.

FLIGHT SIMULATIONS

RAMROM PATROLITIE FIGHTER/KLINGON CAPTURE -- RAMROM PATROL: Destroy the RemRom ships before they capture you, *TIE FIGHTER: Wipe out the enemy Tie fighters and become a hero of the Rebeilion. *KLINGON CAPTURE: You must capture the Klingon ship intact. (T1) Order No. 0028R \$7.95.

FLIGHT PATH.—This three-part package in-cludes: •MOUNTAIN PILOT: Become a daring bush pilot and fly supplies to a remote mining camp. You must cross mountain ranges and struggle with headwinds, tricky navigation and rapidly diminishing fuel. O'HARE: A control towar simulation for you would-be Air Traffice Controllers. You are responsible for the lives of hundreds of passengers as you guide aircraft through your control sector, .PRECISION AP-PROACH RADAR: Combines the skills of pilot and Air Traffic Controller, as your commands guide an aircraft in its approach to the field and a sele landing. (T1) Order No. 0171R \$9.95

BALL TURRET GUNNER-Imagine yourself et the control console of a strategic laser weapon, deep in the space lenas, Your hindelight datector informs you of a Gnal fighter coming in for an attack so you swivel you laser turret until you can see the target. Watch the Range Indicator and your Targeting Computer's readout closely, because you'll only have a traction of a sec-ond to catch him in your sights. Will you transform the Gnat into a ball of ionized gas or will you see that blinding flash that means The Big Demotion? BALL TURRET GUNNER, with you choice of multiple levels of difficulty, optional sound effects and excellent graphics, is more than a game. It's an event to be sevored. (T1) Order No.

JET FIGHTER PILOT-In this brilliantly realistic simulation, you become the pilot of a twin turbo-let fighter. Begin your mission from either the deck of a carrier or from an airfield. Ouring flight, you'll need to constantly monitor your display and make the necessary adjustments to the throttle, flaps, and air spoilers; you must decloe when to retract landing gear and release your drop tanks! There is an on-board Navigational Computer, a Glideslopa/Localizer and a Weepons Control Computer. Earn your wings with JET FIGHTER PILOT. (T1) Order No. 4159R \$14.95.

SPACE TREK II -- Protect the quadrant from the invading Klingon warships. The Enterprise is equipped with phasers, photon forpedoes, impulse power and warp drive. (T1) Order No. 0002R \$7.95.

AIR FLIGHT SIMULATION-Take off and land your aircraft without making a crater. This "instruments only" simulation starts you with a full tank of fuel, which gives you a maximum range of about 50 miles. You'll get constant updates of air speed, compass heading and aititude. After you've acquired a few hours of Hight time, you can try flying a course against a map or doing aero betic maneuvers. T(1) Order No. 0017R:

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BASIC AND INTERMEDIATE LUNAR LAND-ER-Bring your lander in under manual control. The basic version is for beginners; the intermediate version is more difficult. with a choice of landing areas and rugged terrain. (T1) Order No. 0001R \$7.95.

COSMIC PATROL-We put you in command of a small interstellar patrol craft. You must defend Terran space and prey on the Qualon freighters that carry vital war supplies - but beware of their I-Fighter escorts. They're well armed, extremely last and they NEVER miss! With its real-time action, Impressive sound option and auperb graphics, this machine-language program is the best of the genre. (T1) Order No. 0223R \$14.95.

Airmail Pilot -Return to the early days of eviation. You must fly the mail from Columbus to Chicago. Your Jenny, a cloth-covered biplane, must take you through un-predictable winds, half and electrical storms. Your mission is to get the mail through in the shortest possible time. There is an on-board clock to time you flight, from takeoff to touchdown...assuming you are able to complete it. (T1) Order No. 0106R \$9.05.

NIGHT FLIGHT-Your mission is to fly over the North Atlantic and make a nighttime photolrecon flight above the enemy fleet. NIGHT FLIGHT lets you take-off, fly and land a propellar-driven aircraft. You can practice approaches and landings with an on-screen display of the landing field information-it will practically teach you to fly. (T1) Order No. 0117R \$9.95.

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WHO-OUN-IT? Criminal elements have committed live dastardly crimes. As the investigating detective, you must solve

You can compate against either Detective Nybbles, a computerized slauth, or up to four other human detectives.

*DEDUCTION: Guesa the order of four symbols out of six or seven different ones. To make things even more complicated, you can let the computer rapeat symbols and have a range of 2401 possibilities. (T1) Order No. 0047R \$7.85.

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MIMIC—Test your memory and reflexes with tive versions of this popular game. You must match the sequence end location of symbols displayed on your monitor within the time limit. Instructions on how to produce accompanying sound effects. (T1) Order No. 0066R \$7.95

CLIMATE COMP—This two-program peckage includes: WEATHER FORECASTER, which gives you a short range weather foreast based on the information that you enter and WEATHER PLOT, which will display climatological data for any major city in the United States: (T1) Order No. 0102R-1 \$18.95.

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ENERGY CONSUMPTION—This program will record and analyze your utility bills for up to the years, when you supply the following information. Gas/Water/Electricity used and their respective costs. It will calculate six monthly usege averages and unit costs. Deta can be compared for any month or multi-month periods. (11) Order No. 01328 89.95.

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BUSINESS PACKAGE IV—This business package contains two programs:

BUSINESS CVCLE ANALYSIS: This program can plot the expansion and contraction cycles of any aspect of your business.

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FINANCIAL ASSISTANT—Compute the figures for a wide variety of business needs, including: • QEPRECIATION: Figure depreciation on equipment five different ways. • LOAN AMORTIZATION: Enter a few essential factors and get a complete breakdown of all costs and schedules of payment for any loan. • FINANCIER: Performs thirteen common linancial celculations. • 1% FORECASTING: Use it to forecest seles, expenses, or any other historical data series. (T2) Order No. 00728-37.85.

CHECK MANAGEMENT SYSTEM—Use this program for writing checks and maintaining records. You can make entries, editionrect entries and print out the checks. It will also search end display records by number, code, date, description or emount. A Code and Search routine allows you to print e report of all checks written for specific expenses. You can print your letterheed and account number at the top of each report. System requirements: (T2) with a competible tractor-feed printer, 9147RD

ACCOUNTS RECEIVABLE/ACCOUNTS PAYABLE—These Model I programs will handle the drudgery involved in ARIAP entries. They will also provide invoices, statements, reports and more. Each program is capable of handling up to 1500 entries per month, posted to as many as 760 accounts. The ARIAP package is ideal for any small business and can easily be used by anyone familiar with ARIAP operations. System requirements (in addition to 72: Three disk drives and a Line Printer (tractor-feed). Order No. 0075RD 3199.85.

MAIL/LIST—With a five-inch drive, you can store up to 600 names per disk without DOS, or 300 names with DOS. The program maintains seperate alphabetical and ZIP code files under constant sort. When you add a name or ZIP code to your list, it will be inserted into its correct position in the file. The program will record your data in nine fields: address, city, state, ZIP code, phone number, phone extension and name (2) plus a five character code field. The best feature of this program is the sort process that lets you determine alphabetical or ZIP code order for label printing. (T2) Order No. 5000R0.

ONE-D MAILING LIST—A comprehensive mailing list program that will run on only ONE disk drive! Up to 17 lields of selection for name/address retrieval. Its features include: Auto-sort (alphabetic or ZIP code). Easy error correction and recovery. Prints selective listings. Supports up to 4 drives. Prints mailing labels and listing of all names on file. (T2) Order No. 0123RD \$24.95.

EXECUTIVE EXPENSE REPORT GENERA-TOR—Provides you with emergency relief in the form of a clear, plausible expense layout. Input your grand total and cesh advance (if any), and you'll receive an itemized expense report, from breakfast to snacks. (T1) Order No. 0135R \$9.95.

GAMES

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FUN PACKAGE I—Why call it "Fun Package"? Judge for yoursell? This entertaining package includes: *ROCKET PILOT: Flying it is easy—it's the landing that's fought *PAPER, ROCK, SCISSORS: It's the time-honored game just as you remember it, played against your TAS-80. *HEX I: Just when you master this puzzle game, the computer will increase the difficulty. *MISSILE ATTACK: Use your missiles to protect your city from jet attack. Requires * TAS-80 Level 1 18K. Order No. 00378 \$7.95.

DEMO III-The biggest package ISI has ever released, including: • RACE 1: Careen around the race course as you try to beat the clock; TARGET UFO: Destroy all the invading UFOs; . LIFE: Experiment with this simulation of the life cycle of a colony bacteria; PHONE NUMBER CONVERTER: Change those herd to remember 7-digit phone numbers into easily remembered words; @ BIORHYTHM: Plot biorhythm curves for anyone, anytime; · GRAPHICS PROGRAM: This program will show you what your TRS-80's graphics display can do; PACE 2: Five different tracks for the more experienced driver, a HORSE RACE: Up to nine players can bet on and enjoy our most entertaining horse race program; • DRAWING BOARD: Draw pictures or messages and store them in memory or on cassette tape with this easyto-use program; # 24-HOUR CLOCK: Transform your computer into an eccurate digital clock. (TI) Order No. 0055R \$7.95

Oil. TYCOON—Avoid oil spills, blowouts and dry wells es you battle to become the world's richest oil tycoon. Two players become the owners of competing oil companies as they search for oil and control their companies. (T1) Order No. 0023R \$7.95.

BOWLING—Let your TRS-80 set up the pins and keep score. One player can pick up spares and get strikes. (T1) Order No. 0033R \$7.95.

DEMO 11-contains: TIC-TAC-TOE: An old time favorite with three levels of difficully; TIME TRIALS: Try to beat the clock as you race your cer through curves, chutes, and chicanes; . MAZE: One or two players can search through the maze for the secret square; # HANGMAN: One or two pleyers can try to quess the secret word: WHEEL OF FORTUNE: Choose your number, place your bet and see if you can break the bank (for one to eight players); # HURRICANE: You can track and monitor hurricanes in any part of the world; . BUGSY: Can you build your Z-80 bug before the computer does? • HORSE RACE: Pick a sure winner and place your bet (for 1 to 100 players). (T1) Order No. 0049R \$7.95.

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() APPLICATION

by Dennis Kitsz

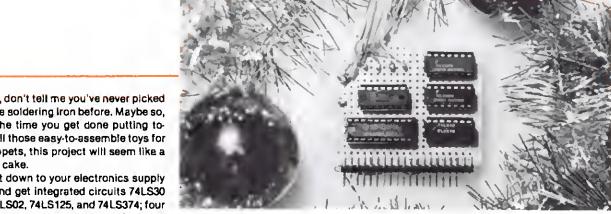


Photo 1. The complete Earle circuit as constructed on a 2 by 2 1/2-inch piece of perfboard.

ow, don't tell me you've never picked up e soldering Iron before, Maybe so, but by the time you get done putting together all those easy-to-assemble toys for the whippets, this project will seem like a piece of cake.

So get down to your electronics supply house and get integrated circuits 74LS30 (two), 74LS02, 74LS125, and 74LS374; four 14-pin sockets; one 20-pin socket; five 1K-ohm resistors; a TRS-80 edge connector; some perf-board and a five-volt power eupply kit. Toss in a pair of audio cables, too, end meybe a little box.

What's Kitsz up to this month? Zounds, sound! Not e just e few raspy squawks, but lots of them...four separate voices, creeted by e mere 160 bytes of e program! This circuit the "Eerie," is in time for the holidays and inexpensive. A bag of parts would make the great gift for someone to while ewey a chilly January hour or two.

The Circuit

The principle of the hardwere is simple: it merely provides a kind of "window" to e single location in RAM. The location we will be spying on is 4FFF hex (20479 decimal). Z3, Z4, and Z5 create a signal which is activated only when we write to location 4FFF (20479 decimal). See Fig. 1.

Z3 decodes the FF byte of the address.

Z5a-c and Z4 decode the 4F byte end combine it with the computer's "write" signal. Z5d NORs the resulting signals together to produce a single pulse defining "write to 4FFF." (See Table 1.)

Z1 acts as an electronic dam end reservoir: Data from the computer confinuously wells up against Z1's input. But the data is permitted to flow into the output, where it is preserved, only when a pulse opens its electronics stulceway. Unlike circuits where the output status is determined by the stable level of a trigger signal, the 74LS374 lets input flow to output only when the trigger (CLK) signal is changing from zero to one. That is, it is edge triggered rather than level triggered.

The CLK signal for Z1 is the output of

Z5d, "write to 4FFF." So when we write to memory location 4FFF, whatever data is being placed in that memory address will elso be brought to the output of Z1.

Finally, Z2 contains four separate threestate buffers. A buffer is merely e device which allows a signal to pass through it, unchanged, in one direction. The threestate quality is an Important one for computers, because dozens of separate circuit outputs are connected to the same set of wires. Confused signals and damaging short-circuits must be prevented. Thus, not only can some devices output a high signal (1) or low signal (0), but they can also turn invisible when they are not needed. This is the important third state.

This three-state butter Z2, though, is not part of any complicated data or eddress bus—its outputs only go to some resistors. Why the third state? It allows us to turn the sound off during a rest; the reasons will become clearer when we take e look at the software.

A few resistors complete the circuit, blending the four outputs into two, as well es offering the outputs of Z2 a bit of protection against casual cable connecting. The discrete channels can be used for those with quadriphonic systems.

The Earle is very simple to build, and can be completed in an evening. Remember to use a regulated five-volt power supply. A good experimenter's supply is sold by Jameco Electronics (1021 Howard Avenue, San Carlos, CA 94070, (415) 592-8097) for \$14.95, although a simpler source, such as that shown in Fig. 2, is adequate for the sound circuit.

Any type of wiring can be used, be-

To decode "write to address 4FFF", convert the address to binary, and identify the address lines associated with each bit:

Hex Vatue: 0 1 0 0 15 14 13 12 11 10 9 8

Step 1 Feed eight eddress lines (0 through 7) to the inputs of an eight-input NANO gete. When all lines go high (1), the output of the NANO gale will be zero

Step 2. Feed address lines 12 and 13 into a NOR gate. When these swing low, the NOR gate goes high. Step 3. Feed address line 15 into both inputs of a NOR gate. When this line goes low, the NOR gate goes

Step 4. Feed the WRITE signal, which is active low, to both inputs of a NOR gate. When the signal is active, the NOR gate goes high.

Step 5. Feed the outputs of the above three NOR gates, which will be high when they form the values need ed, into three inputs of an eight-input NANO gate.

Step 6. Feed the remaining address lines (8, 9, 10, 11, and 14) to the other live inputs of the eight-input NAND gets. When these lines go high together with the lines from Step 5, the output of the gets will be low Step 7. Connect the outputs of both eight-input NAND gates to a NOR gate, When both NAND outputs are ective (they will be low), the NOR gate goes high. Only when the address 4FFF appears simultaneous with a WRITE signal will this combined signal go high.

Table 1

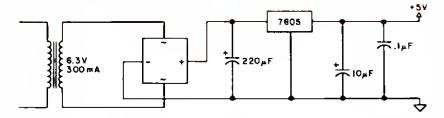


Figure 2. Power source for the sound circuit; any regulated five-volt source is adequate.

cause in this circuit, neatness is a matter of aesthetics rather than necessity. For those new to digital hardware, I particularly recommend the wire-wrapping method as a contribution to sanity; errors in wiring can merely be unwrapped.

Photo 1 shows the completed circuit, which fits on a small 2 by 2 1/2-inch perfboard. The "header" connector on the card's edge is e useful, money-saving substitute for expensive 40-wire cables (which are clumsy to strip and solder to circuit boards). Instead, this connector mates with a cable whose far end plugs into the TRS-80 expansion connector. The cable and a pair of headers can be obtained from Digl-Key Corp., P.O. Box 677, Highway 32 South, Thief River Falls, MN 56701, (800) 346-5144. The cable, which can be used for many projects, costs \$11.95; a pair of headers is \$3.49.

Making Sound with Software

The production of interesting sound and music with microcomputers is a considerable challenge. December *Kilobaud*

Microcomputing features more than a half-dozen ways to create music. Some of the newer integrated circuits described can produce three-voice music, but the programming can be complicated.

The way the Earle creates sound is by listening to the activities taking place in memory location 4FFF. In fect the sound is no more than the pattern of changing electrical impulses of various bits being stored in that memory address!

By carefully considering computer timing, we can turn individual bits of that memory address off and on often enough to produce a square wave. There is only one serious problem: time. BASIC is much too unwieldly to use for producing multivoice sound waves because even its simplest instructions take a large fraction of a second to execute. A simple loop like

10 FOR X = 0 TO 255 : POKE 20480,X : NEXT

takes two full seconds to complete. There's not much manophonic music in

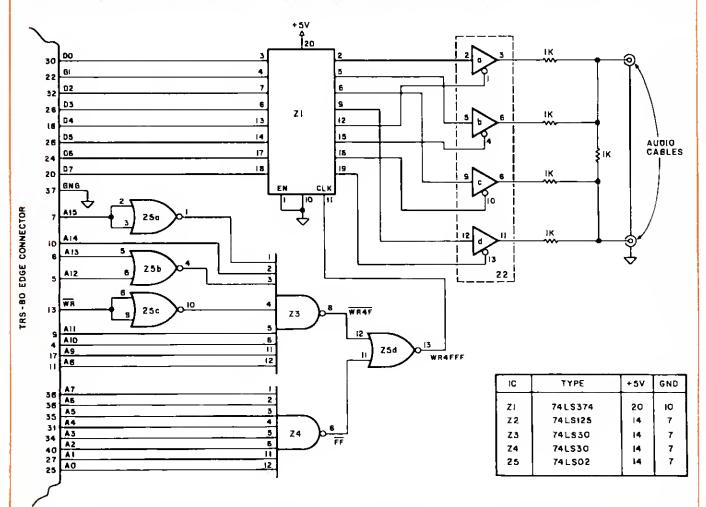


Figure 1. Complete diagram of the simple circuit. The total cost of parts, including cable, is under \$20.



				OUR-VOICE MUSIC SUBROUTINE , ROXBURY, VERMONT 05669
				, KUABUKI, VERMONI BODDY
4F60	00149 ;	OBC	17500	
4F60 DD218050	00150 00160	ORG LD	4F60H IX,5000H	: :NEAR TOP OF MEMORY : :START PITCH & RHYTHM
4F64 01PP4F	00170	LD	BC, 4FFPH	: MEMORY-MAPPED SOUND
	00100 : ****			
	80200 ; OUTE	R (INTER	-NOTE) LOOP BE	GINS HERE; T-STATES 212 - 244
		******	**********	******************
4F67 D9	00220 ; 00230 LOOP1	EXX		:84: READY DURATION REGS.
4F68 DD4688	00240	LD	B, (IX+0)	;19:MSB OF NOTE DURATION
4F6B DD4E01 4F6E D9	00250 00260	EXX	C, (1X+1)	;19:LSB OF NOTE DURATION ;04:STASH REGISTER AWAY
4F6F DD6602	00270	LD	H,(TX+2)	; 19: FIRST PITCH INTO H
4F72 DD6E83	00200 00290	LD LD	L,(IX+3) D,(IX+4)	;19:SECOND PITCH INTO L ;19:THIRD PITCH INTO D
4F78 DD5ER5	00300	LD	E, (IX+5)	;19:FOURTH PITCH INTO E
	00310 ; 00320 ; ****			
				X IS TESTED TO SEE IF IT IS
				F IF IT IS (DEFINING A REST)
	00350 ; ****			
4F7B ØA	00379	LD	A, (BC)	:07: READY TO TWEAK MEM
427C 8602 4278 24	00380 00390	AND INC	0FH H	;04:TURN ALL VOICES ON ;04:BUMP VALUE: REST TES'
4F7E 25	00400	DEC	H	;04:0UMP VALUE; REST TES'
4F00 C2854F 4F03 CBE7	80410 88428	JP SET	NZ, REST1	;10:ONLY 00 DEFINES REST ;00:SILENCE VOICE IF RES'
4F85 2C	00430 REST1	INC	4,A L	104: BUMP VALUE; REST TEST
4PB6 2D	80449	DEC	£	;04:BUMP VALUE; REST TES
4P87 C28C4F 4P8A CBEF	02450 02460	JP SET	NZ,REST2 5,A	:10:ONLY 00 DEFINES REST :00:SILENCE VOICE IF RES
4F8C 14	00470 REST2	INC	D	;84:BUMP VALUE; REST TES
4F8D 15 4F8E C2934F	00488 00490	DEC JP	D NZ, REST3	104:BUMP VALUE: REST TES 10:ONLY 00 DEFINES REST
4F91 CBF7	00500	SET	6,A	;08:SILENCE VOICE IF RES
4F93 1C 4F94 1D	00510 REST3 00528	I NC DEC	E 2	;04:BUMP VALUE; REST TES ;04:BUMP VALUE; REST TES
4F95 C29A4F	00538	JP	NZ, REST4	;10:ONLY 00 DEFINES REST
4F98 CBFF 4F9A 02	00540	SET	7.A	108:SILENCE VOICE IF RES
41 7A 02	00550 REST4	I,D	(BC),A	:07:SET VOICES ON OR OFF
	00600 ;I	NNER LO	OP BEGINS HERE. INUM FREQUENCY	ORM IS TOGGLED DURING LOOPS. T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246
	00600;1 00610; MEAN 00620; OR 7 00630; *****	NNER LOC ING MAX 195.1 H	OP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY GIN PITCH AND F	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770800/246 JENCIES ARE CONSIDERABLY LESS JENERAL STREET STREET REYTHM COUNTDOWN LOOPS
	00600;1 00610; MEAN 00620; OR 7 00630; ****	NNER LOGING MAX: 195.1 H: BEC	OP BEGINS HERE. INUM PREQUENCY Z. USEFUL FREQUENCY GIN PITCH AND F	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 170800/246 IS APPROXINATELY 170800/246 IS APPROXINATELY 170800/248 INTHE COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE
4F9B @A	00600;I 00610; MEAN 00620; OR 7 00630; """" 00640; 90650; """" 90660; 90670; """" 90600;	INNER LOC ING MAX 195.1 H BEC COUNT I	DP BEGINS HERE. INUM PREQUENCY Z. USEFUL FREQUENCY GIN PITCH AND F DOWN THE PITCH A, (BC)	T-STATES STRICTLY EQUAL 24 SAPPROXINATELY 1770809/26 ENCIES ARE CONSIDERABLY LESS SHYTHM COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING
4F9C 25	00600;I 00610; MEAN 00620; OR 7 00630; W*** 00640; 00650; W*** 00660; 00670; W*** 00660; 00670; U***	NNER LOO ING MAX I95.1 H	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQU	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTH COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN PREQUENCY
4F9C 25 4F9D C2A04F 4FA0 EE01	08618;1 08618; MEAN 08629; OR 7 08630; **** 98658; **** 98658; **** 98670; **** 98670; LOOP2 08710 08720	NNER LOCING MAX: 195.1 H: BEC COUNT 1 LD DEC JP XOR	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQ SERVICE FOR SERVICE SIN PITCH AND F SERVICE DOWN THE PITCH A, (BC) H NZ, EXIT1	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1778808/246 ENCIES ARE CONSIDERABLY LESS ENTRY OUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING ;04:COUNTDOWN PREQUENCY ;10:SAME WAVE IP NOT 8 :07:TOGGLE WAVEFORM BIT
4F9C 25 4F9D C2A04F 4FA0 EE01 4FA2 DD6602	98688 ;1 98618 ; MEAN 98628 ; OR 7 98630 ; **** 98658 ; **** 98658 ; **** 98678 ; **** 98679 LOOP2 98710 98720 98730	NNER LOCING MAX. 195.1 H: BECCOUNT : LD DEC JP XOR LD	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL AND A A, (BC) H NZ,EXIT1 H, (IX+2)	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTH COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN FREQUENCY :10:SAME WAVE IP NOT 0 :07:TOGGLE WAVEPORM BIT :19:RESTORE PITCH VALUE
4F9C 25 4F9D C2A04F 4FA0 EE01 4FA2 DD6602 4FA5 C3AE4F 4FA8 FDE5	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; W*** 00640 ; 00650 ; 00660 ; 00670 ; **** 00600 ; 00710 00720 00730 00750 EXIT1	LD DEC JP XOR LD JP PUSH	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1778800/246 LENCIES ARE CONSIDERABLY LESS HYTHM COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE 107:WHAT WAVE IS LURKING 104:COUNTDOWN PREQUENCY 10:SAME WAVE IP NOT 0 107:TOGGLE WAVEFORM BIT 19:RESTORE PITCH VALUE 10:JUMP PAST TIMEWAUET
4F9C 25 4F9D C2A84F 4FA0 EE01 4FA2 DD6682 4FA5 C3AE4F 4FA8 FDE5 4FAA FDE1	00610 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00660 ; 00660 ; 00660 ; 00690 LOOP2 00700 00710 00720 00740 00750 EXIT1	COUNT 1	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY Z. USEFUL FREQUENCY GIN PITCH AND F DOWN THE PITCH A, (BC) H NZ, EXIT1 I H, (IX+2) EXIT1A IY IY	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTHM COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN PREQUENCY :10:SAME WAVE IF NOT 0 :07:TOGGLE WAVEFORM BIT :19:RESTORE PITCH VALUE :10:JUMP PAST TIMEWASTER ;15:WASTE 15 T-STATES ;14:WASTE 14 T-STATES
4F9C 25 4F9D C2A04F 4FA0 EE01 4FA2 DD6602 4FA5 C3AE4F 4FA8 FDE5	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; W*** 00640 ; 00660 ; 00660 ; 00670 ; **** 00670 ; 00700 00710 00730 00730 00750 EXIT1 00768 00770	LD DEC JP XOR LD JP PUSH POP AND	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ, EXIT1 I H, (IX+2) EXIT1A I I OFFH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ***********************************
4F9C 25 4F9D C2A84F 4FA0 EE01 4FA2 DD6682 4FA5 C3AE4F 4FA8 FDE5 4FAA FDE1	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; W*** 00640 ; 00660 ; 00660 ; 00670 ; **** 00670 ; 00700 EXIT1 00769 00770 00730 00790 ; ****	INDER LOCALING MAX 1195 .1 H. *********************************	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY Z. EXITCH Z. EX	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ***********************************
4F9C 25 4F9D C2A84F 4FAB EE01 4FA2 DD6602 4FA5 C3AE4F 4FAB FDE5 4FAA FDE1 4FAC E6FF	00610 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00660 ; 00670 ; 00690 LOOP2 00730 00730 00740 00750 EXIT1 00750 00770 00700 ; 00700 ; 00700 ;	INDER LOCALING MAX INSTANCE OF THE PROPERTY OF	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ, EXIT1 I H, (IX+2) EXIT1A IY OFFH DOWN THE PITCH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 LENCIES ARE CONSIDERABLY LESS HYTHM COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN PREQUENCY :10:SAME WAVE IF NOT 0 :07:TOOGGLE WAVEFORM BIT :19:RESTORE PITCH VALUE :10:JUMP PAST TIMEWASTER :15:WASTE 15 T-STATES :14:WASTE 14 T-STATES :07:WASTE 7 MORE T-STATE
4F9C 25 4F9D C2A84F 4FAB EE01 4FA2 DD6682 4FAS C3AA4F 4FAB FDES 4FAA FDE1 4FAC E6FF	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; W*** 00640 ; 00650 ; 00660 ; 00670 ; 006730 ; 00720 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ;	INDER LOCUITY LD DEC JP XOR LD JP PUSH POP AND COUNT :	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY IY OFFH DOWN THE PITCH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTHE COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN PREQUENCY :10:SAME WAVE IF NOT 0 :07:TOOGGLE WAVEPORM BIT :19:RESTORE PITCH VALUE :10:JUMP PAST TIMEWASTEE :15:WASTE 15 T-STATES :14:WASTE 15 T-STATES :07:WASTE 7 MORE T-STATES :07:WASTE 7 MORE T-STATES :07:WASTE 7 WASTE TWO
4F9C 25 4F9D C2A84F 4FAB EE01 4FA2 DD6602 4FAS C3AF4F 4FAB FDE5 4FAA FDE1 4FAC E6FF	00600 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; W*** 00640 ; 00650 ; **** 00660 ; 00670 ; 00600 ; 00700 ; 00710 ; 00720 ; 00730 ; 00750 EXIT1 00760 ; 00770 ; 00730 ; 00730 ; 00730 ; 00740 ; 00740 ; 00750 EXIT1	LD DEC JP PUSH POP AND COUNT :	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY OFFH DOWN THE PITCH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 IENCIES ARE CONSIDERABLY LESS REYTHM COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN PREQUENCY :10:SAME WAVE IP NOT 0 :07:TOOGGLE WAVEFORM BIT :19:RESTORE PITCH VALUE :10:JUMP PAST TIMEWASTER :15:WASTE 15 T-STATES :14:WASTE 15 T-STATES :07:WASTE 7 MORE T-STATES :07:WASTE 7 MORE T-STATES :07:WASTE 7 MORE T-STATES :08:COUNTDOWN PREQUENCY :09:SAME WAVE IP NOT 0 :07:TOOGGLE WAVEFORM BIT
4F9C 25 4F9D C2A84F 4FAB EE01 4FA2 DD6682 4FAS C3AE4F 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAE 2D 4FAE 2D 4FAE 2D 4FAE 2D 4FAE 2D 4FAE 2D 4FAE 2D 4FAE 4FBE 2E02 4FBE DD6E03	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00660 ; 00660 ; 00660 ; 006700 ; **** 00720 00730 00710 00730 00730 00730 00740 00750 EXIT1 00760 00730 ; 00720 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 0	INDER LOCULATION OF THE POP AND POP AN	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY IY OFFH DOWN THE PITCH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ***********************************
4F9C 25 4F9D C2A84F 4FA0 EE01 4FA2 DD6602 4FA5 C3AEAF 4FAA FDE1 4FAC E6FF 4FAC E6FF 4FAC E2BA4F 4FAC 2D 4FAF C2BA4F 4FB2 EE02 4FB4 DD6E03 4FB7 C3C64F 4FBA FDE5	90600 ;1 90610 ; MEAN 90620 ; OR 7 90630 ; **** 90650 ; **** 90650 ; **** 90670 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90770 ; **** 90810 ; **** 90810 ; **** 90810 EXIT1	INDER LOCUING MAX. ISS.1 H. COUNT I DEC JP XOR LD JP PUSH POP AND COUNT LOCUIT	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY Z. USEFUL FREQUENCY DOWN THE PITCH A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY IY OFFH DOWN THE PITCH L NZ,EXIT2 2 L, (IX+3) EXIT2A IY	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTHE COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE :07:WHAT WAVE IS LURKING :04:COUNTDOWN PREQUENCY :10:SAME WAVE IF NOT 0 :07:TOOGGLE WAVEFORM BIT :19:RESTORE PITCH VALUE :10:JUMP PAST TIMEWASTER :15:WASTE 15 T-STATES :14:WASTE 17 MORE T-STATES :07:WASTE 7 MORE T-STATES :07:WASTE 7 MORE T-STATES :08:COUNTDOWN FREQUENCY :10:SAME WAVE IF NOT 0 :07:TOOGGLE WAVEFORM BIT :19:RESTORE PITCH VALUE :10:JUMP PAST TIMEWASTER
4F9C 25 4F9D C2A84F 4FAB EE01 4FA2 DD6682 4FAS C3AE4F 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAF C2BA4F 4FAF C2BA4F 4FBF DD6E03 4FBF DD6E03 4FBF DD6E03 4FBF FDE1	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00660 ; 00660 ; 00670 ; **** 00670 ; **** 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770 00770	INDER LOCUINT IN THE POP AND JP YOUR LD JP YOU AND LO JP YOU AND JP PUSH POP PUSH POP AND JP YOU AND JP YOU AND JP YOU AND JP PUSH POP PUSH POP	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ, EXIT1 I H, (IX+2) EXIT1A IY IY OFFH L NZ, EXIT2 Z L, (IX+3) EXIT2A IY IY IY	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 177000/246 ENCIES ARE CONSIDERABLY LESS ***********************************
4F9C 25 4F9D C2A84F 4FA0 EE01 4FA2 DD6602 4FA5 C3AEAF 4FAA FDE1 4FAC E6FF 4FAC E6FF 4FAC E2BA4F 4FAC 2D 4FAF C2BA4F 4FB2 EE02 4FB4 DD6E03 4FB7 C3C64F 4FBA FDE5	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00650 ; 00660 ; 00670 ; 00670 ; 00720 ; 00730 ; 00770 ; 00730 ; 00770 ; 00700 ; 00710 ; 00700 ; 00710 ; 00700 ; 00710 ; 00700 ; 00710 ; 00700 ; 00710 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 00700 ; 0	INDER LOCUINT: BEELE COUNT: LD DEC JP XOR LD JP PUSH POP AND LO JP XOR COUNT: LO JP AND LO JP XOR AND LO JP AND LO JP XOR AND LO JP AND	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY IY OFFH L NZ,EXIT2 L L, (IX+3) EXIT2A IY IY OFFH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 177000/246 ENCIES ARE CONSIDERABLY LESS ***********************************
4F9C 25 4F9D C2A84F 4FAB EE01 4FA2 DD6682 4FAS C3AE4F 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAF C2BA4F 4FAF C2BA4F 4FB4 DD6E03 4FB4 DD6E03 4FB4 FDE5 4FBA FDE5	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00650 ; 00660 ; 00670 ; 006730 ; 00720 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ;	LD DEC JP XOR LD JP PUSH POP AND JP PUSH POP AND LD	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY OFFH L NZ,EXIT2 Z L, (IX+3) EXIT2A IY IY OFFH OF	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 IENCIES ARE CONSIDERABLY LESS INTERPOLATION LOOPS LOOP FOR VOICE NUMBER ONE ;04:COUNTDOWN PREQUENCY ;10:SAME WAVE IS LURKING ;04:COUNTDOWN PREQUENCY ;10:SAME WAVE IF NOT 0 ;07:TOGGLE WAVEPORM BIT ;19:RESTORE PITCH VALUE ;10:JUMP PAST TIMEWASTER ;15:WASTE 15 T-STATES ;14:WASTE 14 T-STATES ;14:WASTE 17 MORE T-STATES ;07:WASTE 7 MORE T-STATE LOOP FOR VOICE NUMBER TWO ;04:COUNTDOWN FREQUENCY ;10:SAME WAVE IF NOT 0 ;07:TOGGLE WAVEFORM BIT ;19:RESTORE PITCH VALUE ;10:JUMP PAST TIMEWASTER ;15:WASTE 15 BANANNS ;14:DRUM FINGERS ON 14 ;07:USELESS ARITHMETIC
4F9C 25 4F9D C2A84F 4FAB EB01 4FA2 DD6682 4FAS C3AEAF 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAE 2D 4FAF C2BA4F 4FB2 EB02 4FB4 DD6E03 4FB7 C3C08F 4FBC FDE1 4FBE E6FF	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00650 ; 00660 ; 00670 ; 00600 ; 00710 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 0	LD DEC JP PUSH POP AND	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 1 H, (IX+2) EXIT1A IY IY OFFH L NZ,EXIT2 Z L, (IX+3) EXIT2A IY IY OFFH OWN THE PITCH OWN THE PITCH	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTHE COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE '07:WHAT WAVE IS LURKING '04:COUNTDOWN PREQUENCY '10:SAME WAVE IF NOT 0 '07:TOOGGLE WAVEPORM BIT '19:RESTORE PITCH VALUE '10:JUMP PAST TIMEWASTER '15:WASTE 15 T-STATES '14:WASTE 17 T-STATES '07:WASTE 7 MORE T-STATES '07:WASTE 7 MORE T-STATES '94:COUNTDOWN FREQUENCY '10:SAME WAVE IF NOT 0 '07:TOOGGLE WAVEFORM BIT '19:RESTORE PITCH VALUE '10:JUMP PAST TIMEWASTER '15:WASTE 15 BANANAS '14:DRUM FINGERS ON 14 '07:USELESS ARITHMETIC LOOP FOR VOICE NUMBER TWO LOOP FOR VOICE NUMBER TWO '10:JUMP PAST TIMEWASTER '15:WASTE 15 BANANAS '14:DRUM FINGERS ON 14 '07:USELESS ARITHMETIC LOOP FOR VOICE NUMBER TREE
4F9C 25 4F9D C2A84F 4F9D C2A84F 4FAB EB01 4FA2 DD6682 4FAS C3AE4F 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAE 2D 4FAF C2BA4F 4FB2 E802 4FB4 D06E03 4FB7 C3C84F 4FBC FDE1 4FBE E6FF	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; W*** 00640 ; 00660 ; 00660 ; 00670 ; 00670 ; 00710 ; 00770 ; 00730 ; 00770 ; 00780 ; 00790 ; *** 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810 ; 00810	INDER LOCUINT I	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY IY OFFH DOWN THE PITCH NZ,EXIT2 L, (IX+3) EXIT2A IY IY OFFU OWN THE PITCH DOWN THE PITCH OWN THE PITCH DOWN THE PITCH NZ,EXIT3	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ***********************************
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4F9C 25 4F9D C2A84F 4FA8 E801 4FA2 DD6502 4FA5 C3A84F 4FA8 FDE5 4FAA FDE5 4FAC E6FF 4FAC E6FF 4FAC C2BA4F 4FB2 E802 4FB4 DD6503 4FB7 C3C84F 4FBC FDE1 4FBC FDE1 4FBC E6FF	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; """ 00630 ; """ 00630 ; """ 00660 ; 00670 ; """ 00600 ; 00720 00730 ; 00740 00770 ; 00780 ; 00770 00730 ; 00760 ; 00760 00710 ; 00770 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 00730 ; """ 0073	LD DEC JP PUSH POP AND AND JP PUSH POP AND AND JP PUSH POP AND	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ, EXIT1 1 H, (IX+2) EXIT1A IY IY IY OFFH DOWN THE PITCH L NZ, EXIT2 2 L, (IX+3) EXIT2A IY IY OFFH DWA, EXIT3 A D, (IX+4) EXIT3A	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1778000/246 ENCIES ARE CONSIDERABLY LESS ENTIRE COUNTDOWN LOOPS LOOP FOR VOICE NUMBER ONE ;07:WHAT WAVE IS LURKING ;04:COUNTDOWN PREQUENCY ;10:SAME WAVE IP NOT 0 ;07:TOGGLE WAVEFORM BIT ;19:RESTORE PITCH VALUE ;10:JUMP PAST TIMEWASTER ;15:WASTE 15 T-STATES ;14:WASTE 14 T-STATES ;07:WASTE 7 HORE T-STATES ;07:WASTE 7 HORE TWO ;04:COUNTDOWN PREQUENCY ;10:SAME WAVE IP NOT 0 ;07:TOGGLE WAVEFORM BIT ;19:RESTORE PITCH VALUE ;10:JUMP PAST TIMEWASTER ;15:WASTE 15 BANANAS ;14:DRUM FINGERS ON 14 ;07:USELESS ARITHETIC ***********************************
4F9C 25 4F9D C2A84F 4F9D C2A84F 4FAB EB01 4FA2 DD6682 4FAS C3AA4F 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAE 2D 4FAF C2BA4F 4FB2 EB02 4FB4 DD6683 4FB7 C3C64F 4FBA FDE5 4FBC FDE1 4FBC FDE1 4FC0 15 4FC1 C2CC4F 4FC4 EB04 4FCC DD5684 4FCC FDE5	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00650 ; 00660 ; 00670 ; 00720 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 0	LD DEC JP XOR LD JP PUSH POP AND	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 I H, (IX+2) EXIT1A IY IY OFFH L NZ,EXIT2 L, (IX+3) EXIT2A IY IY OFFH DOWN THE PITCH OWN THE PITCH OWN THE PITCH II NZ,EXIT3 IY OFFH DZ,EXIT3 IY OFFH NZ,EXIT3 IY OKN THE PITCH II NZ,EXIT3 IY IX	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770000/246 ENCIES ARE CONSIDERABLY LESS ENTIRE COUNTDOWN LOOPS (97:WHAT WAVE IS LURKING (04:COUNTDOWN FREQUENCY (10:SAME WAVE IF NOT 0 (17:TOGGLE WAVEFORM BIT (19:RESTORE PITCH VALUE (10:JUMP PAST TIMEWASTER (15:WASTE 15 T-STATES (14:WASTE 14 T-STATES (14:WASTE 14 T-STATES (16:SAME WAVE IF NOT 0 (17:TOGGLE WAVEFORM BIT (19:RESTORE PITCH VALUE (10:SAME WAVE IF NOT 0 (10:JUMP PAST TIMEWASTER (15:JUMP PAST TIMEWASTER (15:JUMP PAST TIMEWASTER (15:JUMP PAST TIMEWASTER (16:JUMP PAST TIMEWASTER (16:JUMP PAST TIMEWASTER (17:USELESS ARITHMETIC (17:SAME WAVE IF NOT 0 (17:TOGGLE WAVEFORM BIT (19:SAME WAVE IF NOT 0 (17:TOGGLE WAVEFORM BIT (19:SAME WAVE IF NOT 0 (17:TOGGLE WAVEFORM BIT (19:RESTORE PITCH VALUE (10:JUMP PAST TIMEWASTER (15:SCMATCH LEFT HAND (14:SCRATCH LEFT HAND (14:SCRATCH LEFT HAND (14:SCRATCH LEFT HAND (14:SCRATCH RIGHT HAND
4F9C 25 4F9D C2A84F 4FAB EB01 4FA2 DD6682 4FAS C3AF4F 4FAB FDE5 4FAA FDE1 4FAC E6FF 4FAE 2D 4FAF C2BA4F 4FAF C2BA4F 4FBC EB02 4FB4 DD6593 4FB7 C3C64F 4FBA FDE5 4FBC FDE1 4FBC E6FF	006000 ;1 00610 ; MEAN 00620 ; OR 7 00630 ; **** 00640 ; 00650 ; **** 00660 ; 00670 ; **** 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ; 00730 ;	LD DEC JP PUSH POP AND JP PUSH PUSH PUSH PUSH PUSH PUSH PUSH PUS	DP BEGINS HERE. INUM FREQUENCY Z. USEFUL FREQUENCY A, (BC) H NZ,EXIT1 1 H, (IX+2) EXIT1A IY IY OFFH DOWN THE PITCH L NZ,EXIT2 Z L, (IX+3) EXIT2A IY IY OFFH DOWN THE PITCH OWN THE PITCH L NZ,EXIT3 A L, (IX+4) EXIT3A IY L, (IX+4) EXIT3A IY	T-STATES STRICTLY EQUAL 24 IS APPROXINATELY 1770800/246 ENCIES ARE CONSIDERABLY LESS ENTIRE COUNTDOWN LOOPS 107 WHAT WAVE IS LURKING 104:COUNTDOWN PREQUENCY 10:SAME WAVE IF NOT 0 107:TOOGGLE WAVEFORM BIT 19:RESTORE PITCH VALUE 10:JUMP PAST TIMEWASTER 15:WASTE 15 T-STATES 14:WASTE 14 T-STATES 10:WASTE 7 MORE T-STATE 20:WASTE 7 MORE T-STATE 20:WASTE 15:WASTE THOMASTER 20:WASTE 15:WASTE THOMASTER 20:WASTE 15:WASTE THOMASTER 20:WASTE 15:WASTE THOMASTER 20:WASTE THOMASTER 20:WASTER 20

the frequency range under 200 Hz (cycles per second); trying to use four voices by this method would result in little more than heed-pounding sonic thuds.

The answer is, in part, mechine language. Look at Program Listing 1; the program begins at 4F60 (decimal 20320). Pitches and rhythms will be stored in a music array beginning at 5000H (20480), so index register IX is set to that value. Since the circuit is mapped to location 4FFF, the BC register is set to that value.

Microprocessor registers are specialized memory locations inside the chip itself. For reasons of speed this program makes use of many of the registers available in the Z-80. To understand why, it's necessary to know how microprocessors work. Certainly they are calculators, but by comparison with the arithmetic powers of chips inside a hand-held scientific calculator, microprocessors are pipsqueaks.

Instead, microprocessors are fest, flexible, general-purpose, switching tools. In response to a combination of binary digits, the thousands of Internal gates of the chip will quickly make one of severel hundred responses. Simple Internal actions can be done quickly; lengthler ones involving reading from, or writing to, memory take more time.

The time it takes a microprocessor to perform any function, then, is dependent on three things: the nature of the instruction, the length of the instruction, and the speed of the computer's master clock. The faster the clock is, the faster the instruction will be completed—at least up to the point et which the circuit components fail to switch an or off fast enough to be reliable.

If we limit the instructions to those that operate on-board the microprocessor chip, we gain speed. But the Z-80 processor is an odd sort of device. It was once described as "en 8080 with wings", because the 8080 had just a few registers and limited vocebulary. If the Z-80 was e true upgrade of the 8080, it would be able to execute all the instructions the 8080 could, and more.

This brings us back to the byte. The byte? Whet? Sure—because the largest number represented by a byte is 11111111, or decimal 255. That limits the number of one-byte processor instructions, obviously, to 255. In order to be a really nifty upgrade, the Z-80 had to do a lot more than the 8080. So its designers took a few unused instruction bytes (called operation codes, or "op codes"), and used them as pointers to a second instruction byte. Specifically, bytes CB, DD, ED, and FE tell the processor that another byte follows; the combination of the two define a brand

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4FD2 1D	01000	EXIT3A	DEC	p	##4:COUNTDOWN PREQUENCY
4FD3 C2DE4F	81106	RWITTOW	JP	N2,EXIT4	710:SAME WAVE IF NOT 8
4FD6 EE88	01110		XOR	8	187:TOGGLE WAVEFORM BIT
4FD0 DD5E05	01120		LD	E, (IX+5)	:19:RESTORE PITCH VALUE
4FDB C3E44F	91136		JP	EXIT4A	110:JUMP PAST TIMENASTER
4PDE FDF5	81148	EXIT4	PUSH	IY	;15:WATER NASTURTIUMS
4FE0 PDE1	#115#		POP	IY	;14:PICK 14 SUCCRINI
4FE2 E6FF	01160		AND	ØFFH	;07:NIX APPLES AND ORANG
	01170	1			
	01160	The second second			
	91200				TION; GET MORE NOTES IF DONE
	01210	1			
4FE4 92		EXIT4A	LD	(BC),A	:07:OUTPUT NEW WAVEFORMS
4PE5 D9	91239		EXX		184:GET STASHED DURATION
4PE6 08	91249		DEC	BC	; 06: COUNT DOWN DURATION
4FE7 78	01250		LD	A,B	:04:SET UP B FOR TEST
4FE8 B1	81268		OR	C	; 04:CBECK AGAINST C
4FE9 D9 4FEA C29B4F	61276		EXX	No. 10002	184:STASH DURATION AGAIN
TEA GZYBAF	01200 01200	:	JP	NZ, LOOP2	;18:GO BACK TIL NOTE END
	01300		******	*******	************
	01310		ALL POI	NTERS PAST CUR	RENT BATCH OF NOTES/DURATION
	01320	; TH	15 15 T	WE REMAINDER C	P OUTER LOOP, T-STATES = 80,
	01330	1 TOTAL	T-STAT	ES OF OUTER LO	OP = 80 + 244 = 324, WHICH I
	61346				LE FREQUENCIES (.0002 USEC).
	01350	4	******	**********	*************
4PED 118688	01368	7	* D	DP C	.ld.wewaby booting me har
4FF8 DD19	81370 81388		LD ADD	DE,6 IX,DE	;10:MEMORY POS'NS TO MOV ;15:MOVE 6 PLACES FORWAR
4 0 0027	01390		AUD	77/100	71311071 0 1 BALLO LORGA
	01400		******	********	****************
	81416		POR EN	D OF PROGRAM O	CODE (88) OR DEPRESSED BREAK
	01429	7 ****			*****************
	01439	7			
4FF2 DD7E88	01440		LD	A, (IX+0)	:19:NEXT NOTE DURATION
4PF5 B7	01450		OR	A Z	194:SET END-OP-MUSIC FLA
4FF6 C8 4FF7 3A4038	81460 01478		RET LD	A, (3848H)	; 05:BACK TO BASIC IF DON ;13:TEST BREAK KYBD ROW
4FFA B7	81480		OR	A (Joseph)	:04:SET PLAG FOR KEY TES
4FFB CA674F	81498		JP	Z,LOOP1	110: CONTINUE PIECE IF OR
4FFE C9	01500		RET	-,	1 1TO BASIC IF BREAK
	01510	7			
	01520		*****	**********	
	01530	2		44.000	
86CC	01540		END	86 CCH	7 PREADY APTER SLASH
80000 TOTAL	PRECNO				
	00750	00710			
EXITIA 4FAE		007 40			
	02000	00840			
EXIT2A 4FC0		00370			
EXIT3 4FCC EXIT3A 4FD2	01010	00970 01000			
EXITSA 4FD2		91199			
EXITAA 4PE4		01130			
LOOP1 4F67		01490			
	00690	01280			
	08430	06410			
REST2 4F8C	88478	00450			
	80510	08498			
REST4 4F9A	88558	90530			

new instruction. This gives the Z-80 upwards of 500 new commands.

The sacrifice, of course, is time. In order to determine the second byte of the instruction, the processor must dutifully "fetch" it from memory.

Fast, on-board Z-80 Instructions use the A, B, C, D, E, H and L registers, singly or in pairs. The alternate set of registers (A', B', C', D', E', H', and L') operate at the same speed. The longer instructions involve, unfortunately, the very flexible IX and IY registers.

The IX and IY registers are "index registers." This means that, when we set IX equal to 5000 (es in line 160 of Program Listing 1), we can operate not only at memory address 5000, but within a half byte's distance in either direction. HL + 1, DE + 6, or BC - 28 have no meaning to the microprocessor, but IX + 1 does, and as such it permits more versetile dealings with any block of data.

Let's go back to the listing, at the beginning of the "outer loop." Since we always want BC to identify the circuit port (4FFF), we will exchange registers, saving this information and moving to the alternate set to define B'C'. They take the values stored at IX + 1 (5001), which will become the total duration of a given note. The registers are then swapped beck.

The H registers is the pitch value for voice #1, the L register defines voice #2, D is voice #3, and E is voice #4. Each register obtains its value from en array identified by IX + 2 (5002) through IX + 5 (5005).

When discussing the hardware, the purpose of Z2 was in question. Lines 370 and 550 provide the answer. The accumulator retrieves whatever value is stored in BC (i.e., at location 4FFF). In the circuit (Fig. 1), four bits are reserved to turn on or off each of the buffers in Z2. By "masking" the value in A with 0F hex (00001111), the four bits farthest to the right are forced low, and the other pitch bits remain unmolested.

Zero is the value used for a rest. Thus, the combination INC H and DEC H leaves the value in the H register intact, yet setting the Z 80's zero flag.

If the value in H (and later in L, D, and E) is zero, then the appropriate bit in A is set high; if the value in H is not zero, the bit is left alone (remember all the Z2 control bits were set low in line 380). A low bit turns on Z2; a high bit turns it off.

Once the voices have been marked on or off as dictated by the values stored in memory, the byte is written to 4FFF in line 550. Recall that "write to 4FFF" is the hardware signal to action, and the circuit responds by mirroring the value written to memory. The circuit now knows which voices to sound end which to silence. The assigned voice will not change until the next trip through this outer loop.

Fecing the Music

Finally the real work begins as the program enters the inner loop. The contents of the BC register (which still points to 4FFF) are retrieved. Four identical routines tollow.

There are some important numbers in the comment column (following the semi-colons) on each line. These count the number of clock periods (called "T-States") required to execute each instruction. An accurate count of these is critical in music.

Each of the pitch registers is decremented until it reaches zero. In the accumulator, the bit representing that voice is then toggled from its present state to its complement (lines 720, 850, 980 and 1110). If the bit was a one, it is changed to zero, and vice versa. The pitch code is then restored by rereading the note value pointed to by the register IX (lines 730, 860, 990 and 1120).

There is some interesting code that is required before a pitch value reaches zero. Examine lines 750, 760 and 770. These instructions do nothing but waste an amount of time equivalent to the time it

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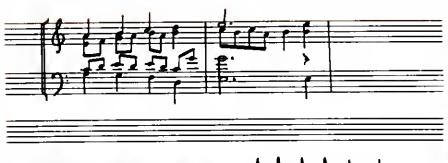




Figure 3. An excerpt from the score translated into data statements in Listing 2, (a) as written in standard music notation, and (b) as transcribed for use with the 4FFF sound circuit.



Figure 4. Useful pitches that can be derived by the program in Listing 1. The pitches shown, which are only approximate, are for a TRS-80 with a 50 percent speed up modification installed. Pitches sound a tritone below on an unmodified unit.

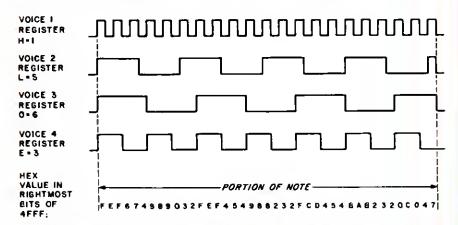


Figure 5. Idealized waveforms present at the output of the circuit, representing the changes to the four high bits in memory location 4FFF.

would take to toggle a bit in the accumulator, restore the original pitch value, and move on. The reason for this is subtle: If we take more time when changing the waveform than when leaving it alone, then a higher frequency (because it toggles more often) will take more aggregate time than a lower frequency. Hence, it will lengthen the loop as a whole, and *lower* the simultaneous pitches in the chord!

When all the testing has been completed for four voices, the result (in line 1220) is written to 4FFF. Thus, whatever wave-torm differences might have occurred are now transferred to both memory location 4FFF and to the circuit. (See Fig. 5.)

in lines 1230 to 1280, the note duration value is retrieved from the alternate BC register pair, and the loop is repeated until the note is complete. When the note is tinished, the index register is moved six places forward to the next block of notes and durations (lines 1370 and 1380).

A duration of zero gives the cue to end the music (lines 1440-1460); if the BREAK key is depressed (lines 1470-1500), the piece also concludes.

The program in Program Listing 2 converts a familiar tune to values which can be read by the assembly language program. Connect the Earle, powerup the TRS-80, set MEMORY SIZE to 20320, and CLOAD the BASIC program. There is just enough room to squeeze it in, but you must CLEARO before running it. Its only job is to read the pitch values for the individual voices and durations and POKE them in place starting at 20480 (5000 hex). The starting address is also put in place.

Load the SYSTEM music subroutines,

Integer	Result	Integer	Result
160	44 970	40	179 878
152	47,336	38	189 345
144	49 966	36	199 864
136	52 905	34	211.621
128	56.212	32	224 848
114	63 115	28	256.969
108	66.622	27	268 486
104	69 184	26	276.735
96	74 949	24	299,797
90	79 946	22	327 051
84	85 656	21	342,625
80	89.939	20	359,756
76	94 673	19	378.691
72	99 932	18	399,728
68	105.811	17	423.242
64	112.424	16	449 695
60	119 919	15	479.675
57	126.230	14	513 937
54	133 243	13	553.471
52	138.368	12	599 593
48	149 896	- 11	654.102
44	163 525	10	719 512
42	171,312	9	799 458
	Tabi	(= D	

```
100 Q=28488 '
110 FOR X = Q+2 TO 22000 STEP6
120 READ A: IF A=255 THEN 380
130 POKE X,A: NEXT
140 DATA 0.0.0
150 DATA3,0.0.0.0.0.0,0.0
160 DATA3,0.0.0.0.0.0,0.0
170 DATA24,0.16,0.16,0.18,0
180 DATA24,0.12,0.24,0.27.0
190 DATA24,0.21,0.24,0.27.0
190 DATA24,0.21,0.24,0.27.0
120 DATA24,0.21,0.24,0.27.0
121 DATA24,24,16,0.16,16,16,18,0
1220 DATA24,24,16,0.16,16,16,18,0
1230 DATA24,24,121,20,20,18,18
1240 DATA16,16,16,16,16,16
1250 DATA15,18,16,15
1260 DATA15,18,16,15
                                                                                                                                                                                                                                                                                828 DATA42,42,64,64,64
                                                                                                                                                                                                                                                                                840 DATA36,36,32,42
850 DATA40,40,40,40,40,0,8
860 DATA40,36,32,0,40,0,3,0
870 DATA40,36,32,8,40,36,40,42
880 DATA48,48,48,8,9
                                                                                                                                                                                                                                                                             880 DATA48,48,48,48,88
890 DATA49,36,32,940,36,48,8
990 DATA42,42,42
910 DATA42,42,42,42
910 DATA40,48,48,48,48,48
920 DATA48,48,48,48,48
930 DATA48,48,48,48,48
930 DATA48,48,48,255
940 REM * VOICE D
950 FOR X = Q+5 TO 22008 STEP6
960 READ D : IF D=255 THEN 1220
970 POKE X D : NEXT
980 DATA48,8,64,8,64,8,64,64,68,54
1000 DATA48,8,64,0,64,8,64,64,68,54
1000 DATA48,8,64,0,64,8,64,80,64,81
1000 DATA48, 0.64,0.64,0.64,0

1010 DATA96,0.64,0.64,0.84,0

1020 DATA96,0.64,0.64,0.84,0

1030 DATA96,0.64,0.64,0.84,0

1040 DATA64,64,64,64,64,64,0

1050 DATA96,0.64,0.64,0.84

1070 DATA96,0.64,0.64,0.84

1070 DATA40,40.84,064,0.84

1090 DATA52,0.84,0.64,0.84

1090 DATA52,72,80,80

1000 DATA64,84,94,96,96
                                                                                                                                                                                                                                                                             1090 DATA72,72,88,80
1100 DATA84,84,96,96,96
1110 DATA84,84,96,96,96
1120 DATA84,84,96,96,96
1130 DATA884,84,96,96,96
1140 DATA888,8,65,4,0,88,80,80,80
1150 DATA96,96,0,64,0,128,0
1150 DATA96,96,96,0,88,88,88,80,80
1160 DATA96,96,96,4,64,62,64,72,72
1180 DATA96,96,60,64,66,64,72,72
1180 DATA96,96,96,96,96,96,96
1210 DATA84,64,128,128
1190 DATA84,64,64,54
1210 DATA84,64,96,25
1220 REM * RHYTHMS
1230 POR X = Q TO 22800 STEP6
1240 READ E : IF E=255 THEN 1490
1250 POKE X,E:POKE X+1,100 : NEXT
                                                                                                                                                                                                                                                                                  1250 POKE X,E:POKE X+1,100

1260 DATA3,3,3

1270 DATA4,4,4,4,4,4,3,3,3

1280 DATA4,4,4,4,4,4,4

1290 DATA4,4,4,4,4,4,4

1310 DATA4,4,4,4,4,4,4

1310 DATA4,4,4,4,4,4,4

1320 DATA4,4,4,4,4,4,4

1330 DATA4,4,4,4,4,4,4

1340 DATA4,4,4,4,4,4,4

1350 DATA4,4,4,4,4,4,4

1360 DATA4,4,4,4,4,4,4
                                                                                                                                                                                                                                                                                    1360 DATA4,4,4,8,8
1370 DATAB,8,8,8
1380 DATAB,8,4,4,8
1390 DATAB,8,6,8
1400 DATAB,8,6,8
1410 DATAB,4,4,4,4,4,4,4
1420 DATA4,4,4,4,4,4,4,4
1440 DATA4,4,4,4,4,4,4,4
1440 DATA4,4,4,4,4,4,4,4
       710 DATA0,0,0,0,40,0,0,0
720 DATA0,0,0,0,40,0,0,0
730 DATA40,36,32,0,40,0,0
                           DATA49,36,32,0,40,0,0,0
DATA49,36,32,0,40,0,0,0
                                                                                                                                                                                                                                                                                     1450 DATA4,4,4,4,4,4,4,4
1460 DATA8,8,8,8
      768 DATA27.27,27,27,0,8
770 DATA40,36,32,0,40,0,0
780 DATA40.36,32,0,40,0,0
790 DATA40.36,32,36,40,0,0
                                                                                                                                                                                                                                                                                    1490 POKE16526, 96: POKE16527, 79
```

Program Listing 2. BASIC listing of a familiar holiday tune to be used in conjunction with the machine-language driver in Listing 1.

and either BREAK or enter a stash ("/"). The place is ready to play. Connect the circuit's cables to a high-fidelity audio amplifier, and type:

PRINT USR(0)

Well, it seems lively enough, but why are the pitches so low? Look at Table 2. The maximum frequency that an unmodified TRS-80 can produce using this program is 719 5.12 Hz, which means the program loops through its actions more than

7000 times per second. By itself, this is a very high frequency, nearly double the highest playable note on en acoustic instrument.

The difficulty arises when we are forced to use one of 255 possible values through which to send our pitch loop. This means that the only possible pitch values are 7195.12 divided by one through 7195.12 divided by 255. The smaller number of divisions aren't close to a treditional scale, although the notes are high. The larger numbers yield pitches that are fairly in-tune,

but also quite low.

You might be forced to think of the melody as being sung by a group of very raspy baritones. Another option is a hardware speed-up to the TRS-80 (see 80 Microcomputing, Feb., 1980). This will raise the pitch a half octave. Another option is to use a retriggerable flip-flop at the far end of Z2. This requires one more integrated circuit to reshape the waveforms and make them audible.

There are also a few software methods, but they reduce the attractiveness of the program. The extraction of a voice will raise the pitch; the extraction of two voices will raise it further. At last, a single voice can be produced which will open up a great portion of the traditional scale. Just think—if another three TRS-80's turn up for the holidays...

It is possible to create a look-up table by compiling the score as it is input, before it is performed. In that way, a composite monaural sound can be produced that is relatively in tune and higher in pitch. However, this method is sophisticated and certainly outside the scope of "Applications."

Of course, the realm of quadriphonic, three-dimensional audio sound effects is still available, and perhaps this is the best use of the Earle.

If you plan to use the circuit with an audio mixer, POKE 20479 (4FFF) with zero before starting; this will get all the volces in phase (i.e., starting at the same time). Likewise, you can experiment with phasing by altering the value in 4FFF before beginning a piece, of at the start of each note.

Those with an expansion interface can save the trouble of building the hardware at the cost of lowering the pitches still further. The pitch value can be stored at 4FFF, but also loaded into 37E8, which is already mapped to the printer port address. Just hook up some resistors to the edge card, and it's ready to go. Of course, you can't use rests in this configuration.

Creating Your Own Tunes

Putting together your own music is time-consuming but straightforward. Fig. 3 is an excerpt from my arrangement of the tune in Program Listing 2. These measures are written two ways: One is standard musical notation, and the other is notated to use with the hardware.

Since the machine language program uses a single loop to produce all four voices, it follows that the loop is concluded at the termination of the shortest note in a harmonic group. That's why a note must be redrawn on the score—as a reminder to include in in the next loop. Also,



each reat is counted as a separate "note of slience," requiring that each rest be no longer than the shortest note played simultaneously with it.

Once you are certain that you've got the score broken into four lines of equal parts, you can greate the BASIC POKE progrem. The pattern is six bytes long, two for duration, and four voices. The note's duration takes two bytes. The tirst byte must be at least 1, and the second can be eny value. I maintain the second byte at 100 (64 hex) in this example, but it can be used to shade the rhythm with rubato.

Finally, the voices tollow in order, one byte for each pitch or rest in the harmonic structure. A zero in any voice position defines a rest, and e zero in the first duration position defines the double bar.

Good luck, and here's hoping you like those raspy baritones!

Personal Thoughts

This month's Applications completes my first yeer with 80 Microcomputing. During that time I have been rewarded with

hundreds of letters and telephone cells from readers with suggestions and questions. Since early spring, every column has been based on suggestions from readers, and there are many more yet to address. So during 1981, expect to discover how to add ROM and RAM to your TRS-80; a step-by-step on converting a machine lenguage program to BASIC

POKEs and strings; what to do when your system stops working; high-resolution graphics (What did he say????); single-keystroke subroutines; and replacing your BASIC ROM with a monitor of your own meking. I look forward to hearing from you, and wish all you remarkable, diverse TRS-80 users the very best during this season and the coming year.

10 FOR X = 20328 TO 20478: READ A: POKE X,A: NEXT 20 DATA 221,33,0,00,1,255,79,217,221,78,0,221 38 DATA 78,1,217,221,102,2,221,119,3,221,66,4 55 DATA 221,94,510,238,15,36,37,194,113,79,283 68 DATA 231,44,45,194,148,79,203,239,28,21,194,147 70 DATA 77,203,247,28,29,194,154,79,203,255,2,10 88 DATA 37,194,160,79,238,1,221,102,2,195,174,79 90 DATA 253,229,253,225,239,255,45,194,106,79,230,2 106 DATA 221,110,3,195,192,79,253,229,253,225,238,255 110 DATA 221,110,3,195,192,79,253,229,253,225,238,255 110 DATA 23,229,253,225,239,255,29,194,222,79,230,20 130 DATA 221,94,5195,228,79,253,229,253,225,230,255 140 DATA 221,219,45,195,228,79,253,229,253,225,230,255 140 DATA 221,21,22,21,126,9,103,200,58,64,56,103,202 160 DATA 211,25,79,20

Program Listing 3. BASIC listing that will POKE in place the assembly language driver for the 4FFF sound circuit. Once this program has been run, it may be deleted to make room for Listing 2.

SAY MERRY CHRISTMAS Give all your friends who own a TRS-80* the best possible Christmas present-80 Microcomputing, 80 Microcomputing is the only journal devoted to the TRS-80* and its users . . . the only journal packed with reviews, programs, applications and hundreds of dollars worth of software. 80 Microcomputing—the best idea for Christmas yet Bill: Me Expire Date Card # Interbank # Signature bill me for My Name 1 year at \$18.00 Address : City # Please enter a one year gift subscription to: Name Address City Canadian \$20/1 year only US funds. Foreign \$28/1 year only US funds All Christmas Gift Subscriptions will begin with the January 1981 issue. 80 Microcomputing ● PO Box 981 ● Farmingdale NY 11737



Model I Caught By FCC Fallout

we you heard that the Model I is being discontinued? That's the latest piece of goselp traveling the industry grapevines.

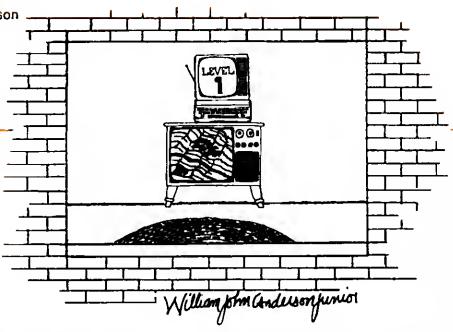
There is reason to speculate on an early death for the first born of Tandy's computer line; Model I micros ere in short supply, and the Model I must be remodeled to meet Federal Communication Commission (FCC) regulations that will go into effect Jan. 1, 1981.

Will the Model I be discontinued? According to Tandy/Radio Sheck's John Shirley, who heads the computer division, "That's not the sort of thing wa'd like to comment on one way or the other." Ed Juge, another Tendy axec, did mention "the difficulty of guaranteeing shipment after the first of the year."

Shiriey claims that Model I computers are presently "in short supply because we are later than we anticipated with the Model III, and it has put a strain on production," But FCC compliance is still up in the air.

The FCC first considered regulating low power communicating devices for radio frequency interference (RFI) in 1976. After three years of study, rules limiting radio frequency (RF) emissions were adopted as amendments to Part 15 of the Chapter 47 laws (laws under the jurisdiction of the FCC). The amendments, rather then covering the broad range of electronic communicating devices, regulate computer RF amissions only. They are particularly strict for personal computers.

The problem originates with conflicting uses of the electromagnetic spectrum, which carries television and radio signets. The extremely quick electronic signets and pulses that are the basis of computer operations create high frequency radio waves. Circuits and traces sometimes ect



es antennee for these waves. Unless filtered, computer generated RF interferes with radio and TV transmission.

In delineating the need for regulation, the FCC has divided computers into two broad categories: Class A and Class B. A Class A "computing device is marketed for use in commercial, industrial or business environment(s)"; and a Class B "computer device is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environment(s)."

The term "computer device" is meant to stretch to the realm of peripherals, which are elso required to comply by Jan. 1 if thay are merketed for consumers.

A study of the Part 15 amendments, conducted by Wewer & Mahn for the Micro Industry Trade Assoc., points out that the "duel classification scheme is rooted in the theory that Class B (consumer) devices are in closer proximity to redio, TV, end in many cases, lend mobile services then Class A (commercial) devices and thus have a higher potential for causing interference."

Restrictions on Personal Computers

For this reason and others, the FCC is imposing heavier restrictions on home computers. Gene Smerfe, the technical editor of 73, a magazine for hem redio anthusiasts, estimates that Class B radietion limits are over 3 times more demanding than Class A limits. His calculations are based on the figures given in Tabla 1, which are taken from sections 810 and 830 of Part 15. Wewer & Mehn

have interpreted Cless B limitations to rule out RFI from 450Kh to 1000Mh—practically the whole broadcasting range.

Actual compilence to the new rules is elso less stringent for Class A products in the view of the Wewer & Mehn law firm. Manufacturers are required to "verify" Class A complience—a lax measure in comparison to "certification" which is required for class B devices. Certification is granted on the basis of testing, application forms and fees. Verification is granted on the basis of the manufacturer's word about test results.

The Effect on Prices

Depending on the amount of research and development required to meet the regulations, it is likely that FCC compilance will result in price hikes for severel products.

John Shirley, the corporate head of the computer division of Radio Shack, says that, "There's no question a substantial amount of money has been spent on R and O because of this." Shirley believes the price of some products will remain unchanged, but that other prices are bound to reflect the added work.

Price increeses will not affect the new color computer, which has been registered with the FCC as a TV interface device under separate FCC guidelines. Although cost has been added to the menufacture of the Model III, Shirley does not believe it will werrant a price hike for customers. "The Model II is a Class A device in our opinion," Shirley says, and should

Continues to page 56

Micros Spotted in Crime Lineup

hat crime has kept pace with technology is an inescapable fact of life, but the problem has assumed a whole new dimension with the advent of computer science. The nub of the problem is that business and government have all too frequently plunged into the computerization of their operations with little or no regard for security.

It is not a small problem nor is it a simple one. Estimates of losses due to computer crime run anywhere from \$100 million to \$40 billion ennually, but the rather disturbing truth of the matter is that no one really knows how much is being siphoned off.

Microcomputer Crime

Heretotore, computer crime has been primarily limited to the realm of mainframes and minicomputers, but microcomputers are fest becoming a favored tool in the compucrook's burgler bag. For

example, a micro might be programmed to mimic a terminal and thereby secure eccess to a sensitive data bank. It may also be used to clandestinely duplicate a signon routine just long enough to obtain the large computer's password. The thief may then interrogate perhaps thousands of systems at his convenience.

Microcomputer-related crime may also take the form of an automated "cottage industry." Such was the case recently in Pennsylvania where John "Cap'n Crunch" Draper was arrested for "phone freaking," spoofing Ma Bell's dial codes to make free use of the phone lines.

Although the offense is not new, Draper's updated version of it was more sophisticated than previous methods in that he used a microcomputer. Utilizing a highly involved program, Draper interfaced his Apple II with his home phone via a modem. He was then able to scan the phone system for operating WATS lines. Eventually he was detected by the phone company's monitoring equipment.

A simpler form of micro crime was uncovered earlier this yeer in Tulsa, OK where a bookle had neatly and efficiently encoded ell of his illicit transactions on his desk-top computer. His operation was reided, but, much to the consternation of the vice squed, none of the usual trappings of a bookle joint were apparent. All the records were mainteined on a few diskettes.

The police lugged the equipment back to the station house where they tried, unsuccessfully, to crack the computer's protocol code. Falling in this they summoned a manufacturer's rep. In a 1980 version of an old "bright lights and rubber hoses" session the rep successfully interrogated the "accomplice," paving the way to conviction of the bookle.

All of this is Greek to the public at large and, predictably, the person

on the street tends to be skeptical of that which he does not understand. Recently, a survey entitled "Dimensions of Privacy" was performed by Weston Assoc. for Century Insurance, Inc. Among the results are these three items which serve to illustrate the somewhat uncomfortable feelings many people have about computers in general.

54 percent of the respondents now believe that computers are a threat to privacy; 63 percent feel that the use of computers should be sharply curtailed to preserve privacy; and 51 percent state that in 10 years people will have lost much of their ability to keep their lives private.

Laws on Computer Abuse

State and federal lawmakers have introduced several proposals designed to curb computer abuse. Sen. Abreham Riblcoff (D-Conn) has sponsored S-240, The Federal Computer Systems Protection Act, now being studied by the Senate Judiclary Committee. Originally introduced in 1976, the bill has since undergone substential rewording to more precisely deal with the technicalities of the ereas it covers.

The bill in its present form was drafted by Philip R. Manuel, an investigative consultent in the field of white collar crime and for 11 years chief investigator for the U.S. Senate's Permanent Subcommittee on investigation.

"Computer crimes (controls) have to date been shoehorned into existing by inadequate laws dealing with crimes ranging from mail fraud to obscene phone calls," said Manuel. "But this bill clearly defines computer crime as computer crime and affords a large measure of protection to the computer systems of the federal government, finencial institutions, and all businesses which conduct interstate commerce. It further envisions protection for sophisticated electronic funds transfer systems whose vulnerability to computer fraud is enormous."

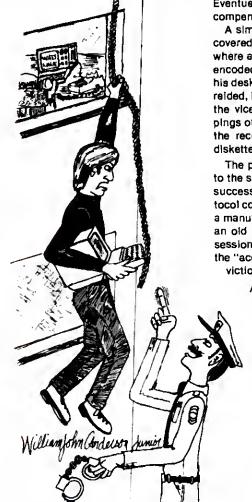
Several laws have been enacted on the state level to define and control computer crime. California's legislation in this area is generally acknowledged to be among the best to date, although it is not above criticism.

Don Parker, a computer crime expert with SRI International in Menio Park, CA finds himself in agreement with most of the California's computer crime statute but, takes exception to the lew's definition of computers. He says it excludes "progremmable pocket calculators with atteched external memory devices." In Perker's opinion, the clause is vague and it constitutes a week spot in an otherwise good plece of legislation.

Combatting Compuctime

Effective methods of combatting compucrime ere, of course, available. Mainteining the physical security of the computer can be divided into four broad clessifications: 1) controlling the entrance to

Continues to page 58



Competency Tests Processed by TRS-80s

t Conant High School, Jaffrey, NH, a TRS-80 is being used to process and record state mandated tests. Administrators et Conant believe it is the first 80 applied to Competency Testing. The tests are required in New Hampshire, as they are in 38 other states.

The tests are mandated under NH State Stetute 186.5, Section Six, which delineates the powers and duties of school boards. The law has been on the books since 1973, however, it was only in 1977 that the state implemented a set of guidelines called the Accountability Plan under which competency testing falls.

The Accountability Plan has six steps with which each school district in the state must comply. They include performance indicators, essessment, analysis of data (Specifically, the state wants to know what the proficiency level is for a whole school in math, language arts, history and science.), and a management plan which outlines district plans for improvements in levels of proficiency throughout the year.

Do these tests contribute to the level of proficiency? Since Competency Testing was first implemented about four years ago, the middle-school students in the Jaffrey-Rindge district have steadily increased their performance level on the Stanford Achievement Test, a standardized norm test given nation-wide. The overall average fell into the ninth stanine in 1979, which is in the highest percentile of echievement, Larry Bramblett, director of instruction for the district, said that when competency testing first started students placed in about the fifth stanine, which is in the average range.

Putting 80s to Work

This particular school district is shead of its time—not only in instituting the test but also in their method of compiling results and making them as timely as possible.

John Davys, senior consultant to the NH State Office of Education, and the administrators of this school district feel that the micro is vital to how successful these specialized tests can be.

Davys feels that the Conant project is significant on a statewide level because, "It is unique in the sense that they have maximized the use of technology. Schools have one of the largest stores of human resource and this resource bank shouldn't be tied up with mundane tasks. Technolo-

gy does those tasks more accurately and quickly and allows the staff to work with the students—which is the way it should be."

At a meeting of the Joint Management Council of educators from all over the stete, Keith Burke, chairman of the council and principal of Conant H.S., gave a demonstration of how their TRS-80 has helped the district menage Competency Test results.

"The council is there," said Burke, "to help other districts implement Competency Tests. They (the council) are always looking for a better way to do it and one way is through managing and keeping track of the data." That's where the 80 comes in.

"The most Important thing Is keeping accurate records of the testing results or else the whole system goes out the window. The computer handles this very well," said Burke. "Also, it's within 98 percent of the school districts' budgets."

Bramblett said that compiling the results without the computer took too much time and it was also costing the district about \$7,000 annually to have someone work on them full time. The whole system—Radio Shack Line Printer III, TRS-80 48K Level iI—including the program, cost the Jaffrey-Rindge district roughly \$5000.

In New Hampshire, Competencies are taken in grades three, seven and 10 and are given et least three times a year. The way the system works, if a student passes all four areas of testing, for example, in the seventh grade, that student will not have to take the exams again until the 10th grade. If a student doesn't pass the Competency in a particular area, science for example, but passes in the other three areas, that student will only retake the failed test until it's passed.

How Conant Discovered the 80

Conant H.S. has owned a 8K PET, for the past few years. Both Burke and Brambiett saw what the most basic of micros could do and decided that a computer was what they needed in order to compile and turn around test results quickly.

After checking out both APPLE end PET systems, they were told by both dealers that it would be difficult converting the program. Because the program was originelly written on a TRS-80 by programmer Peter Wells, and because he highly recommended the TRS-80, it became the logical choice.



Dave Bremblett Praising Micros to Educators

Some of the specifics of the program are updating, displaying and adding to student records of the Competency Test results. A summary record for the whole school, a class or en individual can be displayed and printed. All of these categories are represented by percentage rates. The program also generates a mailing list to parents.

One disk contains the test results of all the students in a particular school. The information on the data disks are safeguarded by program disks which are protected by code words. The disks are duplicated and put into a safe.

Robert L. Brunelle, commissioner for the New Hampshire State Department of Education, feels that the use of microcomputers to process testing results can be a valuable tool.

"The system is all interconnected," says Brunelle. "Each district must report to the commission. From this data, the commission does a statewide sampling and from the sampling reports to the Legislature, and in turn the Legislature acts accordingly with the overall findings."

The use of micros in the achool districts to compile test results could expedite what can normally be a long and tedious bureaucratic process.

Besides taking care of the paperwork of Competency Tests, Burke is working on programs that will do scheduling and report cards.

Some of the students at Conant H.S. have also become fascinated with the many uses of the TRS-80. "For example," said Burke, "the student council president was having trouble keeping track of the inventory in the school store, so he wrote a progrem to take care of the problem. It (the TRS-80) is a fantastic teaching tool."

By Pamela Petrakos 80 Staff



Readers' Digest Swallows the Source

n a jointly Issued press releese spokesmen for the Reader's Digest Assoc., Pleasantville, NY and the Source Telecomputing Corp., McLean, VA, announced the Source's acquisition by the Digest for an undisclosed amount. Terms of the acquisition were not made public and spokesmen for both organizations are extremely reticent when queried about the deat.

Rumors of the Source's financiel woes have been rife for several months, and if the microcomputing grepevine is to be believed, the reasons for the Source's take over are likely to lie in its own financial problems.

The event is newsworthy in light of parties involved: The Digest is a multimillion dollar publishing conglomerate, and the Source is a pioneer in microcomputer network technology.

In a carefully worded press release an unidentified spokesman for the Digest is quoted as follows: "The service which can

be rendered in helping to expand the delivery of education, health care services, information and knowledge via cable systems, telephones, satellites, etc., is thoroughly consistant with our publishing philosophy."

Several words stand out: Education, health care services, cable systems, satellites. It appears that someone within the Digest organization has big plans for the Source. What these plans are will remain conjecture until both organizations decide to lift the veil of slience they have painstakingly maintained. Everyone who is anyone within the Digest organization prefers not to comment. Spokesmen for the Source have proved equally tacitum, and one can only wonder why.

Logical Merger

The merger of a publishing conglomerate and a computer network is quite logical. This type of arrangement reflects current trends within the publishing industry regarding smell company acquisition by

larger organizations and efforts by large corporations to diversify their operations as a hedge against the declining economy.

Jack Taub, chairman of Source Telecomputing Corp., says in the joint press release, "We could not have found a better partner than the Reader's Digest." He is probably correct. The vast financial resources the Digest has at its disposal and the business acumen it brings to the computer network industry are formidable. The impact this merger will have on the Source's 7000 present customers is unclear, however.

One thing is obvious. Changes are taklng place within the computer network industry.

Though a clear picture of what can be expected as a result of the Source's takeover has yet to develop, the doings in Pleasantville and McLean indicate one thing—this might be a good year to ask for a modern for Christmas.

by Chris Brown 80 Staff

Campaign Applications: Did Computers Influence Voters?

hat really went into the Presidential campaign? Did we choose a winner for the intelligence, integrity and capability of the candidate, or did we judge the product of a computer inspired version of the perfect politicien?

John Cragan and Donald Shleids, professors of communications at Illinois State University and the University of Missouri, developed a computer program that analyzes demographic statistics and opinions polied from a given geographical area. The program then chooses among several versions of statements addressing current political situations and arranges e campaign speech that should appeal strongly to the average voter in the polled area.

In the September 22 issue of Computerworld, Cragan is quoted as saying, "I'm sure that almost every [candidate] out there today is using a variation of this. I don't think it's as sophisticated or as cynical, but it's something that is used to pretest [statements and ideas] before you have a candidate saying them."

Before the nation made its choice at the polls, I spoke to campaign workers et the national headquarters of the three major presidential candidates. Each campaign made use of computers in several applications; none edmitted to using them to the extent suggested by Cregan, however.

Carter's Camp

The Carter campaign probably had the most organized and effective applications. BIII Krause was the Director of Information Services at the national headquarters. He had a staff of three, himself, one of Carter's sons, and a 19-year-old who came on the staff and was trained in BASIC.

In-house, the campaign used Tektronix microcomputers for standard data processing. With these, they kept files on all personnel and volunteers: skills, when they were available for work, etc.

The largest day to day job tackled with the computers was scheduling. The schedule of who should be where doing what changed often—particularly in the last few weeks of the campaign. Members of the Carter family on the campaign trail traveled with a terminal, and checked scheduling changes daily through the campaign's mailbox at The Source.

The Carter campaign also used the New York Times Info Bank, with which they've had a contract since 1969. The Info Bank was used to do research on the other candidates, and to scan news stories for keywords concerning Reagan, military force, etc. The campaign people received abstracts of articles containing pertinent keywords, and these facts were used in

turn for campaign speech writing. This method of research and fect gathering greatly reduced the work involved in tracking Carter's opponents, and dropped the necessary information into the laps of Carter's speech writers.

Krause said the general election budget was done on the G. E. time sharing system. IBM System Six word processors were used for personalized letters and other mail.

The Anderson Campaign

John Boswell, EDP Coordinator (among other things) for the Anderson campaign, described three computer applications used in that office. Ninety-five percent of the budget was used to keep computer files on contributers and supporters of the Anderson campaign: contribution history, general personal characteristics, income, and other statistics which could be used by state campaign offices looking for local volunteers and canvassers.

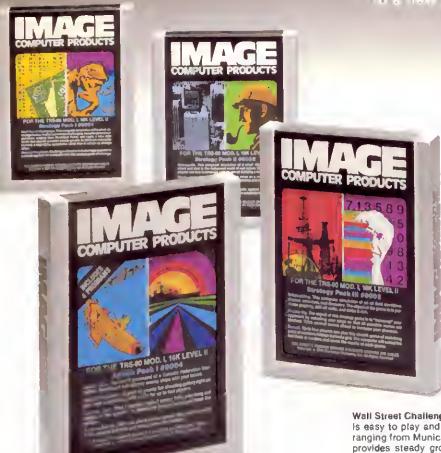
Other applications mentioned by Boswell were payroll and disbursement records. All of these applications were in turn used again to prepare internal management reports and the required income reports to the FCC.

The Anderson campaign was under

Continues to page 56

Put an IMAGE" on your TRS-80

These careagle programs will infroduce you to a new generation of quality continuits as the second of the second o



Everything from Fast-action animated skill games through mind boggling Strategy and Simulation programs is included in this software collector's series.

Each package contains a quality program cassette in a protective storage box, and complete operating instructions.

These programs run on a 16K Lavel II TRS-80 Model I.

Stratagy Pack I #8001

Wall Street Challenge. This computer simulation of the stock exchange is easy to play and always challenging, Invest in several corporations ranging from Municipal Power and Light, a blue chip stock that usually provides steady growth, to Offshore Industries Limited, a high-flying speculative stock that is certain to change often.

Roman Checkers. Challenge a friend or fest your logic and skill in a match against the computer with this ancient game of strategy.

Stratagy Pack II #8002

Metropolis. This computer simulation of a small city lets you wheel and deal in the fast-paced world of real estate. Up to eight players can buy businesses with an eye on building a fortune.

Mindmester. This classic strategy game takes on a new dimension as the computer designs the hidden problems and reports the results of each guess.

Wordmaster, Multiple players may compete against the computer to find the hidden word. Each player can select the level of difficulty that matches his individual skill.

Strategy Pack III #8003

Wildcatting. This computer simulation of an oil field combines chance, adventure, and discovery. The object of the game is to purchase property, drill oil wells, and strike it rich.

Frame Up. The object of this strategy game is to "frame-up" your opponent by selecting your plays so that all possible moves are blocked. Think several moves ahead to increase your chances of winning.

Recalt. Up to four players can play this classic game of matching pairs of numbers hidden behind a grid. The computer will select the numbers at random and score the results of each guess.

Action Pack I #8004

Spece Ace. You are in command of a Galactic Federation Starfighter. Search out and dastroy enemy ships with your lasers.

Shooting Gellery. A good of county fair shooting gallery right on your own computer. Loads of lun for up to four players.

Bomber Run. Pilot a bomber behind enemy lines searching out targets on the ground. Or, defend the ground and shoot down the bomber.

Air-Sea Battle. Pilot your plane over an enemy ship and try to sink it. Or, captain the ship and shoot down the bomber.

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8001	STRATEGY PACK I	\$19.95 ea.		
8002	STRATEGY PACK II	\$19.95 ea.		
8003	STRATEGY PACK III	\$19.95 ea.		
8004	ACTION PACK I	\$19.95 ea.		
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HANDLING

TOTAL

158

CARD#

EXPIRATION DATE _



FCC-Model I Dance

Continued from page 51

not be affected by the Class B deadline. Table 2 charts the current Pert 15 status of Radio Shack computers.

Shirley made no mention of the Model I in reference to expected price changes. It is questionable whether or not the time and money required to modify the Model I warrant compliance. How much is a hobbyist willing to pey? And whet about the Model III option? These are bound to be the thoughts of Tandy's top brass.

Interim Labela

Dave Garner, Tandy's liason with the FCC, says, "We will not make a computer that does not meet compliance after Jenuary first." In his opinion the company has three options:1) interim labels; 2) redeveloping products; and 3) dropping products. Products that are marketed after Jan. 1, 1981 that do not meet Class B specifications must carry the following label permanently attached:

This equipment has not been tested to show compliance with new FCC Rules (47 CFR Part 15) designed to limit interference to radio and TV reception. Operation of this equipment in a residential area is likely to cause unacceptable interference to radio communication requiring the operator to take whatever steps are necessary to correct the interference.

Garner explains that there is currently no time limit on the use of those interim labels. They ere being used broadly for peripheral devices, since tew companies have reached that stage in the certificetion process. But deadlines for the Interim stage are expected soon.

Garner summed up Tandy's position as he understands it by saying that "All of our product line will eventually meet compliance." The statement sounds positive and reassuring to consumers worried about the obsolescence of their micros. But what has he said? Will the Model I be dropped from the product line? Or will the Model I be remodeled?

by Nancy Robertson 80 Staff

Clasi	a A Hadiation	Limits
Frequency (F)	Distance	Field Strength
(MHz)	(metars)	(uV/)
30-88	30	30
68-216	30	50
216-1000	30	70
Cla	se & Radiation	Limits
Frequency (F)	Distance	Field Strengths
(MHz)	(meters)	(uV/)
30-88	3	100
68-216	3	150
216-1000	3	200
	Table 1	
Model I-not cert	ified	
Model IIverified	Class A	
	ertified, althou	gh the application
has been filed.	and the state of	talaulaina tataafaan
under separate F		television interface

Micros in the Campaign

Continued from page 54

contract with a service bureou in Illinois, which did their data processing on an IBM 360. Because of their tight budget, all information traveled to this service bureau in hard copy form by mail, or by telephone.

Boswell agreed that the Anderson campaign was at a disadvantage by lacking the funds to gather demographic characteristics by computer. Any statistics gathering of this sort had to be done manually, through Information Service subscriptions or by contracting with a pollster. The same was true for researching other candidates or local issues in areas in which Anderson was campaigning.

Raagan's Ratinue

Several calls to Reagan's headquarters, and conversations with several different people there, produced the information that computers were being used in the campaign, but no one was sure what kind of computers, or what applications, or who was in charge.

So there you have it computer fans. Computers were involved in nearly every aspect of presidential campaign planning this year. Yet, unanswered questions remain: Does the handicap of not being able to afford all the time-saving and speechdirecting applications seriously affect chances of winning en election? If you don't know how your computers are used, or where they're kept, can you really use them effectively? How much of what we saw in 1980 was acutally a data bank's vision of how to deal with the opponent's latest political speech? Computers may not have written the speeches in this election, but what about next time?■

> by Debbie Marshall 80 Staff

Compucrime

Continued from page 52

the room where the computer is housed; 2) protecting the medium upon which the program is stored; 3) protecting the medium upon which the data is stored; and 4) controlling the forms on which the output is printed.

A more effective type of security meaaure involves the softwere itself—such as the use of passwords which cause the progrem to ebort unless specific, prearranged information is input upon request.

Another common method of protection is encryption. There is now a date encryption standard (DES), a chip for implement-

ing this stendard, and lots of proposals for alternative systems, including some very attractive "public key" systems.

Table 2

Aside from the technological aspects of controlling computer crime, the need to develop more effective psychological/motivational techniques is elso being popularized.

Deterrents and controls notwithstanding, the fact remains that the vast new frontiers now opening up through the applled genius of microprocessors continue to attract the outlaw element who, like crooks of every era, thrive in an environment where controls have not yet caught up with the expansion.

by Paul Quinn 80 Statt

Educational Software Symposium

An Educational Software Symposium will be held Jan. 17-18, 1981 at the Holiday Inn, Bridgeport, CT. Topics will include "Educational Software for Elementary Schools" and software for particular curriculums, as well as how to write educational software. Registration is \$85. Contact Queue, 5 Chapel Hill Dr., Fairfield, CT 06432 for reservations or further information.



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- 2. Fast multi-pass compiler supports powerful chorus and repeat features
- 3. Play program with four modes Standard mode for individual songs. Juke box mode for creating your own song menus. Use keyboard mode for turning your computer into a real-time instrument. Rehearsal mode for playing along with your computer,
- 4. Wevelorm program lets you create instrument sounds in addition to the 14 supplied.
- 5. Utility program gives hard copy print out Transmits music files via modem,

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SCRINPUT comes with user manual of instructions, examples and demo programs. Even the loan worksheet program and a source of listing of the machine language code are given. Try SCRINPUT. If you are dissatisfied for ANY reason, return it within 10 days for a full refund.

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NEW PRODUCTS

Edited by Chris Crocker

S-100 Processor Board Eliminates Polling

The Model CPD-280 is a Z-80A based, second-generation processor board designed for the S-100 computer bus. It operates at four megahertz and is geared toward multi-user systems. Eight vectored priority interrupts maximize the central processor's executable time by eliminating the need for polling. A real-time clock generates the interrupts required by the multi-user operating system.

Two serial and two perallel ports utilize direct memory access for high speed data transfer. All functions are performed by LSI chips.

The second generation processor board costs \$750. Volume discounts are available from Measurement Systems and Controls, 867 N. Main St., Orange, CA 92668.

Reader Service - 164

Double Density Software

Disk Zap 2.3, a disk editor from Micro Systems Software will work either single or double density disks. It is track and sector oriented, and offers access to all parts of the disk. It formats end backs up disks, as well as edits them.

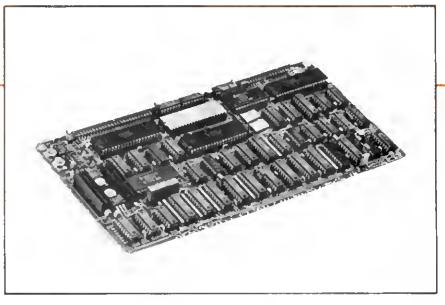
DOSPLUS 3.1D, also from Micro Systems, is similar to most single density operating systems, but offers the increased storage of double density.

Disk Zap 2.3 costs \$19.95, and DOS-PLUS 3.1D is \$99.95 from Micro Systems Software, Inc., 5846 Funston St., Hollywood, FL 33023.

Reader Service - 172

Utility Cleans Disks

Nupurge is a utility program that cleans disks of unwanted clutter after a program is killed. It loads the disk directory into memory, and lets the operator choose which programs to keep and which to kill.



MSC Processor Board

The unused sectors are zeroed.

In addition, according to Soft Sector, Nupurge will figure out the password of any program. The program costs \$24.95 on disk from Soft Sector Marketing Inc., P.O. Box 2471, Livonia, MI 48150.

Reader Service - 173

Education Sampler

Education Sampler is a program for high school math/science courses. It will test, self-drill, or provide answers in three subject areas: algebra, geometry, and chemistry.

The user may select en enswer accuracy level for testing purposes between .01 and 5% error. The cassette version costs \$15 from Harry H. Briley, P.O. Box 2913, Livermore, CA 94550.

Reader Service - 166

Radio Shack 1981 Computer Catalog

Radio Sheck's 1981 TRS-80 Computer Catalog No. RSC-4 lists Model I and II equipment, as well as the new Model III, Color Computer and Pocket Computer.

Also notable are the Deisy Wheel II Printer which produces typewriter quality hard copy for \$1,960; a Plotter/Printer that produces hard grephics for \$1,460; and Videotex, a two-way information refrieval system terminal for \$399. New educational hardware for the TRS-80 includes the Network I Controller, which allows teachers to upload and download programs for up to 16 student stations for \$499.

The catalog also lists books and software and is available tree from Tandy/ Radio Shack, 1300 One Tandy Ctr., Fort Worth, TX 76102.

Reader Service - 185

Business Analysis And Forecasting Package

Oracle-80 is a business analysis and forecasting package from Instant Software. The package can be used in sales analysis and forecasting, product planning and business planning. Investors can analyze stocks, company trends and growth rates. The package can be used in analysis of general economic climates, business cycles and energy consumption trends.

Oracle-80 requires a TRS-80 Level II with 16K and a disk drive, and costs \$99.95 for disk or \$75 for the cassette version.

Oracle-80 was released in Instant Software's fall-winter cafalog. The cafalog includes 55 new programs for the TRS-80 Software for any season.



At The Bottom Shelf, we're continuing to produce some of the best TRS-80TM software available anywhere. In the two years since we released the Library 100, we've developed sophisticated data managing, general accounting, and system utility packages. We also developed the first disk drive head cleaners for both Model's I and II. The result has been resounding acclaim from users, dealers, and computer magazines.

But this is just the beginning. In 1981, TBS will introduce for the Model II the most dazzling and intricate applications software it has yet produced. The culmination of ten months of work. In early 1981, you will witness MEGAMAIL, the most thorough and professional mailing system ever written for the Model II.

We've come along way in two years. We are now on the threshold of a new era in computer programming. The Bottom Shelf is leading the way. With software for all seasons.

TRS-80TM is a registered trademark of the Tandy Corporation.



NEW PRODUCTS

Pharmacists' Aid

Pharmacy Associates' catalog lists programs for medical and pharmaceutical use. Programs Included are: Antibiotic Dosing, Aminoglycoside Dosing, and Total Parenteral Nutrition.

The programs require TRS-80 Level II or Disk BASIC with 16K. The catalog elso lists a TRS-80 Pocket Computer version of Aminoglycoside Dosing. All programs are available from Pharmacy Associates, 1202 Fox St., Bossler City, LA 71112.

Reader Service - 170

Catalog Lists New Books

A 16-page catalog from Creative Computing Press features three new booke. Computers in Mathematics: A Source-book of Idees offers 224 pages of classroom activities. The Impact of Computers on Society and Ethics: e Bibliography, compiled by Gary M. Abshire, lists over 1900 entries, including books, magazine articles, news items, and scholarly papers. Katie end the Computer by Fred D'Iganzio and Stan Gilliam is an illustrated adventure story that explains the workings of computers to children.

The catalog also describes a record album of computer music, a board game, T-shirts, reprints, back issues of *Creetive* Computing and ROM and ten additional books. The catalog is free on request from Creative Computing Press, P.O. Box 789-M, Morristown, NJ 07960.

Reader Service - 160

Shrink Data Files

Reduce is a program designed to reduce the size of a data file made with Radio Shack's Profile data file system. It allows a number of data files to be used on the same disk with a BASIC program.

The program also will reduce the file size on the Profile disk to use only one file in a BASIC program, and use the BASIC program on the Profile disk. Reduce costs \$19.95 and is available from Micro Development Systems, 720 Dartmouth Lane, Schaumburg, IL 60193.

Reader Service - 162

Circult Design Software

The Circuit Design Software programs are 37 engineering and statistical programs on seven cassettes from Howard W. Sams and Co.

The new series of programs are for use in the design of active filters, matching pads, attenuators, heat sinks, integrated circuit timers, Zener diode regulators and bipolar translator circuits. The programs allow the operator to solve simultaneous equations with real and complex coefficients and polynomial roots. The operator also can determine the effects of design perameters.

The packages require Level II BASIC and at least 16K RAM. Prices range from \$16.95 to \$21.95 and are available from Howard W. Sams and Co., Inc., 4300 W. 82nd St., Indianapolis, IN 46268.

Reader Service - 163

Program Calculates Intoxication

Intoxitron, a progrem from The Lawtech Co. estimates a subject's blood alcohol content and degree of intoxication, based on sex, weight, number and strength of drinks, and time since the first drink. A single occasion can be analyzed, or a general chart may be produced.

INC., another program from Lawtech, explains cumulative voting, performs calculations necessary to understand and allocate shareholder voting power, and contains a checklist of pitfalls, as well as a bibliography. Each program requires a 16K TRS-80 with Level II BASIC and costs \$16. They are sold by The Lawtech Company, P.O. Box 1523, La Grande, OR 97850.

Reader Service - 174

Hard Disk System Works with TRSDOS

HDOS-2 is a hard disk operating system designed specifically for use with TRS-DOS 1.2 on the TRS-80 Model II. The program allows a standard Corvus hard disk drive to be interfaced to existing software with minor changes to the software, according to Computer Program Associates.

The system occupies 1K at the top of memory, and allows multiple drives to be used. It restores PEEK and POKE commands, and adds three new BASIC commands. HDOS-2 supports only rendom access files; and programs or sequential

files may not be stored on disk.

Prices were not released. HDOS-2 is evallable from Computer Program Associates, 150/6 Beltway Dr., Dallas, TX 75234.

Reader Service - 178

Parallel I/O Board Has 5-V Supply

The Parallel Input/Output Board is a new peripheral board from Persteve Electronics, Ltd. for the TRS-80. It connects directly to the edge connector at the back of the computer. The board contains nine eight-bit I/O ports and is controlled via the Level II BASIC instructions INPUT and OUTPUT. It is powered by a single 5-volt power supply.

The assembled version costs \$65; an unassembled bare board is also available from Persteve Electronics, Ltd., P.O. Box 3623, Stn. D, Ottawa, Canada K1P 6H8.

Reader Service - 167

General Accounting Package and CP/M System

A General Accounting Package consisting of a general ledger, accounts receivable, accounts payable and a complete CP/M operating system for the TRS-80 Model II are available from Microed.

The package uses double entry with user-definable accounts. Seven levels of account classification are possible with up to four digit fields at each level.

The CP/M operating system included has all of the standard CP/M programs plus Microed-written utility programs. These utility programs can format disks, copy disks, and operate on a single drive. Microed CP/M for the Model II is capable of single or double density operation and automatically senses the density of the disk. The complete package costs \$415 from Microed, 3910 Bandini St., San Diego, CA 92103.

Reader Service - 161

Corrections

Regrettably, two photos were interchanged in the November New Products section. The Micromatic 80 belongs on page 58 and the Mediamix 50/80 interface on page 56, Our applicate for the confusion.

Also, we reported the address incorrectly for Multi Media Systems in our September Issue. The correct address is Box 41084, Indianapolis, IN 46241.

Enjoying 80 MICRO? then read on...

80 MICROCOMPUTING has proven, in its first several issues, that it can give you more information on the TRS-80* than any other single source. The magazine has grown more informative with each month and we still have lots more interesting ideas in the works for you.

With the TRS-80* (or 90...etc.) being the most popular microcomputer in the entire world, you are going to benefit from this in many ways. The more computers there are out there of one kind...the more good programs you are going to have for this system. I hope that is obvious. You may be sure that 80 MICROCOMPUTING will be packed with the shorter programs and reviews of the lerger ones. You can waste an awful lot of money on stuff that looks great in the ads, but fizzles out when you try to use it. You need our reviews.

The wealth of programs will also mean that there will be much better programs for the TRS-80° than any other system. Put yourself in the seat of a computer progremmer and you'll understand this, if you are going to spend several months developing a comprehensive program, and it takes all of that to write and debug a big program, would you write it for a system which has sold one hundred units or one which has sold over 300,000 systems? The answer is obvious...and this is why we are already seeing programs coming out for the TRS-80° which are far better than anything for any other system on the market. This is tough for other systems ...the law of the computer jungle.

Between our connections with Instant Software, the largest publisher of microcomputer programs in the world, and Kilobaud Microcomputing, you know that 80 MICROCOMPUTING is going to be your most importent link with software for the TRS-80*.

With Instant Software being sold and promoted in every country in the world where the TRS-80° is being sold, our input of programs is also the best in the world. We get programs submitted from everywhere...often from 50 to 100 a week! You'll get the cream of the crop either published or reviewed in 80.

HARDWARE TOO

The same law of the computer jungle holds for hardwere. Would you, as a manufacturer, market an accessory for a system which has sold 100 units or would you go

first for the one which has sold hundreds of thousands. It is, as with software, self-evident why the great bulk of the hardware accessories for computers are for the TRS-80* these days.

80 MICROCOMPUTING has the advantage of the use of the largest and most complete microcomputer lab in the world...the one developed for Instant Software and Kilobaud MiCROCOMPUTING. This means that most new pieces of equipment are tested and in use by our staff...and this means that we can tell you what we think is outstanding...and where we find ripoffs. This lab is important to you.

SUBSCRIBE

If you are not already a subscriber to 80 MICROCOMPUTING, please get signed up right now. The yearly rates are \$18, and that is a bargain. Just one single program of use to you can be worth much more than that. One review of an accessory could save you many times that much investment. I would appreciate it if you would appoint yourself a committee of one to get more subscribers for the magazine. You will benefit even more than we do here at the magazine... because the more readers we have, the more ads we will be able to attract... and the more ads, the more pages of articles you will get every month.

The 80 market can, I think, support a couple of hundred pages of ads...and that would mean a magazine of nearly 500 pages a month. That should hold you. You may not have time left to use your computer.

ENCYCLOPEDIA

If you've read Kilobaud MICROCOM-PUTING, you know that I try hard not to

microcomputing

Peterborough N.H. 03458

duplicate published material. My concept is that every reader should save every issue (we sell inexpensive boxes for this so they can sit on your library shelf) and treat the magazine as a continuing encyclopedia of computing. I make sure that much of the material in each issue is written in simple language so it will be understandable by even the rawest newcomer to computers. Oh, I have articles for the more advanced users too, so you'll have something to look back over later and use as your understanding of your system grows.

Try to think of 80 MICROCOMPUTING as more of a large club newsletter than an ivory tower high-level publication. I'll leave the pomp to other publishers...the ones with the well-deserved inferiority complexes who cater to their inadequacies by publishing esoteric baloney. This magazine is written by the readers and edited by people whose aim is to help you enjoy your TRS-80*.

SAVE

With each issue costing \$2.50 at your computer store, that's \$30 a year. For \$18 a year you can subscribe... at least for now. As the magazine expands, please do not be surprised if the cover price increases, along with the subscription price. I started 73 Magazine for radio amateurs twenty years ago with a cover price of 37¢ (two for 73¢) and it is up to \$2.95 a copy now (and it is the largest of the ham magazines).

For you bargain hunters...and those who find that one year goes by all too rapidly, the three year rate for 80 is \$45. This, too, will be going up...reflecting the inflation, paper increases, postage increases, and a short vacation for me in Hong Kong next year. Someone has to pay for that.

If the coupon below has been used, please fill out subscription form on the Reader Service card in the back of the magazine

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Back issues, while available are \$3 each Canada; \$20 per year US funds

All other foreign subscriptions, \$28 one year only.

PMC-80 Level II 16K at \$645



SOFTWARE COMPATIBLE

- Reads all Level 11 BASiC tapes
- Reads all SYSTEM tapes
- Full range of peripherals

The PMC-80 is a "work-alike" computer to the popular TRS-80* Model I, Level II by Tandy, Radio Shack. The PMC-80 has 16K bytes of RAM and the complete Level II 12K BASIC ROM by Microsoft that makes it 100% software compatible with programs from Radio Shack and from the hundreds of other independent suppliers. The built-in cassette player reads standard Radio Shack programs for the TRS-80.*

Sold through computer stores.

- Video output for monitor and TV
- · Optional FASTLOAD at 8000 baud
- Optional Upper/Lower case

The PMC-80 will operate with any of the many peripherals Radio Shack and other independent vendors have invented to plug into the TRS-80. Most importantly, the interface Adapter permits Expansion interfaces with memory expansion to 48K to be added. An Expansion Interface will also permit the addition of Radio Shack compatible 5½" disks and disk operating systems, RS 232, printers, etc.

*TRS-80 is a registered trademark of Tandy, Radio Shack.

Personal Micro Computers, Inc. 422

475 Ellis Street, Mountain View, CA 94043

(415) 962-0220

NEW PRODUCTS

Payroll System Maintains Tax Files

PR is a payroll system for the TRS-80 Model II that calculates payroll for employees while maintaining monthly, quarterly and yearly totals for reporting purposes to multiple states. Tax tables are maintained via on-line commands with no programming required, according to Micro Architect, Inc.

PR requires TRSDOS 1.2, a 132-column printer, a dual disk system and 64K memory. The program costs \$129 from Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174.

Reader Service - 181

Index on One Disk or Two

Two new versions of the Keyword Indexing System are available from Northeast Microware. The Keyword Indexing package is a series of programs enabling the user to create a disk file, build an index of all key words, and search for them using combinations of key words.

The new systems include an enhanced version for two disk systems and a compressed version for one disk systems. Both require 32K of memory and run under TRSDOS. They are aveilable from Northeast Microwere, P.O. Box 2133, Boston, MA 02106.

Reader Service - 183

Lighting and Fault Current Programs

Two electrical engineering programs from MC.2 have on-board files of equipment and fixture characteristics.

The E3M Fault Current Program uses a per-unit calculation procedure and permits an unlimited number of bus voltage levels, panels and branches. Three-phase symmetrical voltage and fault currents are calculated at any point in the system, with or without line voltage drop.

The E5M Lighting Program automatically calculates the number, spacing and location of luminaires required to give a desired level of illumination in a project of up to 100 rooms. The program also will determine the lighting level supplied by a given number and type of fixture.

Prices were not released. The programs are written for the TRS-80 Models I and II from McClintock Corp., P.O. Box 430980, Miami, FL 33143.

Reader Service - 185





Belden Bit Driver

Short-haul Modem

The Belden Model 9338 metellic conductor Bit Driver short-haul modem is part of an RS-232C compatible data transmission system.

The Model 9338 metallic Bit-Driver modem provides asynchronous simplex and duplex data transmission. The metallic conductor unit is recommended for use in clean electrical environments. Depending on the type of cable selected, operation range extends from 1500 to 4500 meters. The price of Model 9338 is \$195 from Beiden Corp., 200 S. Batavia Ave., Geneva, IL 60134.

Reader Service - 184

Program Tests, Drills

T.E.S.T. Is a classroom aid from T.Y.C. Software. The package contains two programs: a Maintenance Program and a Test and Drill program. The Maintenance Program creates a test of up to 35 questione and eaves it on cassette. In order to produce a test, a question is typed on any topic (up to 240 characters), the type of question—true or false, multiple choice, or completion—and the correct answer

entered. When finished, the test is saved on cassette.

Test and Drill is a utility program designed to accept the test prepared by the maintenance program. With the Test and Drill program, students can either use the questions as a review, take a scored test, or the teacher can have the computer prepare a printed test or worksheet with answer key.

The package contains two programs and a manual for TRS-80 Level II, 16K for \$11.95. For more information, contact T.Y.C. Software, 40 Stuyvesant Manor, Geneseo, NY 14454.

Reader Service - 176

Terminal Programs Transfer Files

SMART80E and SMART80C are terminal programs for use with the Exatron Stringy Floppy and cassette-based systems, respectively. The programs are used in conjunction with a direct-connect telephone interface called The Microconnection.

The terminal programs allow the transfer of BASIC programs and source code files. The programs also feature software selection of helf and full duplex plus the ability to transfer text created by either Electric Pencil or Scripsit in upper/lowercase. For additional information on SMART80E, SMART80C or The Microconnection, contact The Microperipheral Corp., Box 529, Mercer, Is., WA 98040.

Reader Service - 177

COBOL Compiler On Release 2 CP/M

RM/COBOL, a high-intermediate level ANSI-74 COBOL compiler, is available on Release 2 CP/M systems for \$495.

This compiler, compatible with several minicomputer COBOL compilers, has alternate keys (multi-key ISAM), CRT screen handling, program segmentation, interactive debug, and other Level II features. Implemented under the Cybernatics, Inc. version of Release 2 CP/M on the TRS-80 Model II, RM/COBOL is source-program compatible with Tandy's COBOL.

The RM/COBOL User's Guide and the RM/COBOL Language Manual may both be obtained for \$40 (refundable upon purchase of RM/COBOL), from Cybernetics, Inc., 8041 Newman Ave., Suite 208, Huntington Beach, CA 92647.

Reader Service - 169

Five DOS Utilitles And Teachers' Package

The Alternate Source has a fiveprogram utility package for the TRS-80. Three of the programs are written in Z-80 machine language and can be used with either Level II cassette systems or with DOS systems. Two are written in BASIC, for use with DOS systems only.

The three Z-80 utilities ere distributed with a relocatable module which allows them to be dumped at the user's specified starting address. They are BTrace, Compress Program Utility and Search.

When TRON is activated, BTraca leaves the screen display intact and places any lines being executed in the upper right-hand corner of the screen. Compress Program Utility allows BASIC programs to be compressed in a variety of ways. Search will locate eny BASIC line containing whatever argument the user wishes to find.

The two BASIC DOS programs are Changes and Replace. Changes provides a screen or printed listing of the differences between two programs. Replece will locate ell occurrences of en argument and replece it with a string.

The package is available on a single disk for \$29.95.

Schoolmaster, a separate package, is a record keeping system for teachers. It generates cumulative reports for each student, and flags students whose assignments are missing. Teachers can examine a variety of grading methods before recording grades, according to the Alternate Source. Schoolmaster will present both individual and class statistical data.

Schoolmaster requires a 32K TRS-80 with one drive. The program comes on diskette for \$24.95. Programs are avallable from The Alternate Source, 1806 Ada Street, Lansing, MI 48910.

Reader Service -326

Disk File Directory

Master Diskette Directory version 1.1 reads, stores and categorizes the directories of up to 320 disks. The program will list all files on disk, by file extension, disk number or program category.

Master Directory will also search for a file name and list every number of that file, its size, and the number of the disk containing the file.

The program is available for \$29.95 from Micro Systems Softwere, Inc., 5846 Funston St., Hollywood, FL 33023.

Reader Service -341

Information Retrieval for TRS-80

SE (Search Entry) is a general purpose information retrieval program. It is a machine language program for the TRS-80 Model I, Level II.

SE's command structure facilitates data entry, data searches, and quick data storage and retrieval on tape or disk, according to the manufacturer, Information Technology Systems. Some commands are available from the ENTER Option response with a single keystroke.

Targets can be any combination of 64 characters, employing unlimited ANDs and ORs, according to ITS. The program includes error messages and error checking proceduras.

Data entries are identified by a threecharacter code assigned by the user. All of memory, less 4K for the program, is available for storage.

SE is sold in two versions: SE2.0 for 18K Lavel II (cassette) costs \$24.95, end SE3.0 for DOS up to 48K costs \$49.95. SE is available from Information Technology Systems, Post Office Box 2667, Saresota, FL 33578.

Reader Service -334

Series of Educational Instruction and Utilities

Rite 80 Software is selling several series of field tested programs for use in schools. Written for Level II machines, the series are Math, Spelling, Topics, Earth and Rollbook.

The Math Series consists of three programs for individual or group work, designed to help students increase their speed and accuracy in basic arithmetic. The three programs in the Spelling Series drill students on rote memorization of spelling words.

The Topics Series, four programs, allows teachers to test students on any subject, using short phreses or single words as answers. The program will accept different words with the same meaning for correct answers.

Earth is a video enimetion of the earth rotating on its axis. Rollbook is a disk utility for teachers. It will record up to 100 grades for 40 students.

Rollbook is priced at \$49.95 from Rite 80 Software, 4660 Willens Ave., Woodland Hills, CA 91264. The other series are priced by program. Programs cost \$19.95 each, with discounts given for the purchase of en entire series.

Reader Service ≥335

Elcompco Disk Drive System

The Elcompco disk drive is a case and power supply with either MPI-B51 or Shugart SA-400 drives. A large 18,000 uF capacitor and fixed voltage regulators are included to reduce ripple and noise from the power supply. The heat sink is mounted externally, and allows the drive system to run cool while powering drives, according to Elcompco.

The system is available with one drive or two. Kits are available for the case and power supply only, or including drives. The drive will power mini-tioppy drives compatible with Shugart or MPI power requirements.

Dual drives with case and power supply cost \$800. Single drive in double case is \$475, and a single drive in single case costs \$400. The kit without drives costs \$135.

The drive systems were released in Elcompco's winter catalog of herdware end software.

Catalog and disk drives are available from Elcompco Microcomputer Peripherals, P.O. Box 6133, Albany, CA 94706.

Reader Service -339

TRS-80 Data Management System

Data Access Corp. has DataBank software for TRS-80 Model II microcomputers. Databank is a system of pre-programmed, data independent modules that are adaptable to each user's requirements.

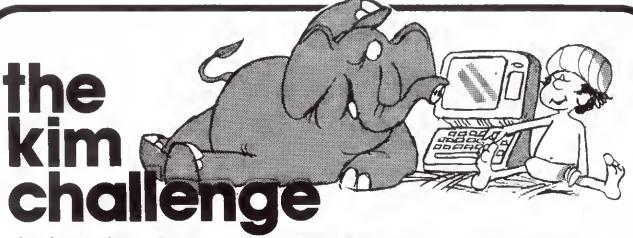
File maintenance, data management and report generation functions are operable as soon as the user indicates file specifications. Typical applications include mailing list maintenance, inventory and accounting records, student or personnel files, and patient/client data systems.

DataBank uses hashing, assemblar subroutines and other techniques. Files can span up to four disk drives with as many as 32,767 records. Key access time to a given record is a second or less.

Modules are divided into four main groups: configuration utilities, file maintenance, report generator, end e subroutine library. A multi-purpose editor program is also included.

DataBank runs under TRSDOS and BASIC. It is priced at \$249 per installation from Data Access Corp., 4221 Ponce De Leon Blvd., Coral Cables, FL 33146.

Reader Service ≥ 175



From Rudyard Kipling's KIM, General Computer brings you an adaptation of the exciting, mind expanding game of memory and recall. KiM uses dynamic handicapping to compensate for skill differences while urging each player into greater challenges. Everything adjusts —display times, number of objects displayed, identification difficulty, and even scoring as you play your way through a data-base of thousands of items. Quicken your perception, sharpen your awareness, and

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Waldo T. Boyd Jon Etherton PO Box 86 Geyservilla, CA 95441

ou have just taken possession of a draam—a new TRS-80. Set it up, switch it on, and reach for the home row on the keyboard. Your fingers flick from key to key, and, slowly but surely, into the memory goes your first program. Wunderbart

The chips work perfectly; the terminal screen glows brightly with your first effort. Everything seems to be in order. Could anything be wrong?

Nothing, you say. It's perfect!

Lat's look mora closaly. What about the arrangement of the alphabet on the kay-pads: QWERTYUIQP, Just like the millions of typewriters in homes and offices avarywhere in the English-speaking world, right?

Yas, it is. And that is precisely what is wrong with hundreds of thousands of computers. The computer itself is lightning-fast and potentially, arror-free, except for the most vital consideration of all—the man to machine interface.

The latters on the keyboard are placed in positions that will cause you to make arrors in your input, that will tire you, that will keep your entry speed far below your true operating potential.

A Little History

Your computer inherited a kayboard that was originally designed for the type-writer by an inventor named Christophar L. Sholas in 1873. His first production machina looked vary much like a sawing machina. Its typebars were hidden from the operator's view, striking upward from beneath the platen (paper rollar), so the operator couldn't see what had been typed until three or four lines later.

Worse than that, typebars, which lay next to one another, had so much mutual friction that if the operator struck an adjacent key too soon, the first key struck would fail to fall back into its rest position in time to miss the upcoming key. The result was a key jam, not easily remedied in those early hand-built machines.

Sholes was no less than ingenious in his approach to fixing these jams. By studying the fraquency of occurrence of the latters in the majority of common words in the English language, Sholes reduced the number of jams per sitting.

Ha found that by placing the operating keypads in a certain sequence, he could slow down the faster operators, and the typist could hunt-and-pack through dozans of letters with no more than one or two serious jams. This sequence ansured that

the operator stayed below ten words per minuta, the critical speed of hia machine. This, we can say with 20-20 hindsight, was human angineering—In raverse.

Look once mora at the kayboard on your TRS-80: You are viewing the kayboard Mr. Sholes produced for the specific purpose of slowing down the 1870's operator, so his machine would operate without jamming!

It wasn't long befora far bettar machines than Sholas' cumbersoma "sewing machina" wara davaloped and markated, but for soma inaxplicabla reason avary manufacturar who jumped into the burgaoning typewritar markat copied tha kayboard laid out by Sholas. Everyone took for granted that QWERTY was as good as any other arrangament.

Bruca Blivan, Jr., author of *The Wonderful Writing Machine*, has this to say about QWERTY: "Judged scientifically...from the standpoint of the touch typist, this arrangement of the alphabet is madly inconvenient. According to one of the many persons, including psychologists, angineers and student Ph.Ds who have studied it, the standard keyboard is considerably lass afficient than if the arrangement had been laft to simple chance."

A Breakthrough

But for the perseverance and insight of Dr. August Dvorak, late protessor of English at Washington State University, we would be stuck with QWERTY for all time. Dvorak heard the anguished cries of a few far-eighted touch-typists and arranged a

"When he had completed his work and tested it in the early 1940s, his keyboard was found to be twenty times easier to use..."

U.S. Navy contract to humanly-engineer the typewriter keyboard.

When he had completed his work and tasted it in the early 1940s, his keyboard was found to be twenty times easier to use than QWERTY.

His brain-child, the Dvorak Simplified Keyboard (DSK), can be learned in one-quarter to one-half the time required to learn Sholes' old system, and DSK touch typists become so proficient that they leave the QWERTY typist far behind in appeal and accuracy.

DSK users commonly type 100 wpm, while the average QWERTY typist is hard-put to better half that speed. The world typewriter speed record holder is a DSK typist.

Why, if the DSK is so efficient, doesn't industry adopt it and build typewriters and computers with the new keyboard? The answer lies in two realms that affect mankind universally: tradition and economics. Typiets train on QWERTY in high school. They enter the job market, able to type about 45 wpm on the average. Their prospective employers have QWERTY keyboard typewriters waiting for them. The schools provide typists to fit the business office; typewriter manufacturers provide machines to fit the operators who are trained by the schools. Catch 22!

Dr. Dvorak's keyboard was ready for market in 1944, more than a decade ahead of ENIAC, the first major computer. Yet, the first computer operators were typists who had mastered the QWERTY keyboard. Not aurprisingly, these highly accurate, lightning-fast machines are today provided with—nay, saddled with—a QWERTY keyboard!

The DSK however, is finally catching on, in spite of tradition in the marketplace.

A few pioneering court raportars and freelance writers have used the DSK over the years. In the past twenty years the number of users has increased to the extent that two typewriter manufacturers now offer the DSK on new machines at no extra cost: IBM and Smith-Corona (SCM).

So far, no manufacturar has offered the DSK as an option on new computers, but the computer itself provides a simple way

to use either kayboard at will. Software for this purpose has been developed and will soon be available on tape.

The Software Route

The software program (Program Liating 1) presents a reasonably simple way to convert the TRS-80 keyboard from QWERTY to DSK. This program permits in-

"Why, if the DSK is so efficient, doesn't the industry adopt it and build typewriters and computers with the new keyboard?"

stant changeover from QWERTY to DSK and back to QWERTY by preasing two keys simultaneously, the shift key and the zero key. Thus, Instant comparison of one keyboard with another is possible.

The 183-byte program le loaded into the desired memory location by means of a BASIC relocating program, which also gives some operating instructions and does decime! to hexadecimal conversions of the starting and ending addresses. The machine language code is contained almost antirely in the data statements on lines 170-184. (If you want to seve some affort you can leave out all but Lines 8, 100-2330 and 10000-10040.)

The program is compatible with other machine language utilities, such as Radio Shack'e KBFIX, but KBFIX must be loaded first.

To load the program below another machine language program (such as a printer driver) subtract 183 from the current memory aiza. This gives you the new memory aiza to be used when powering up the computer.

Be aura to tape at least one copy of the

BASIC program before running it. If any of the data statements contain an error the Z-80 may jump back to memory location zero, thus wiping out your program.

After loading the BASIC program, type RUN. The program asks you if you remembered to set memory size and then prints some explanatory information before asking for the starting address. This is usually, but not necessarily, the same as the memory size.

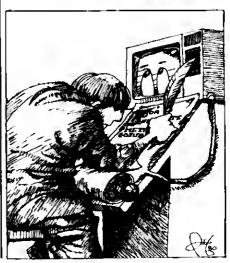
After you entar the starting address, the program proceeds to POKE in the memory locations selected. These locations and data are displayed on the screen.

The program then prints more information, including the starting and anding addresses in hexadecimal. You may want to make note of the address for the start of the lookup table, for future reference.

To exacute the program, type SYSTEM (enter). When you get the *? prompt, type / and the starting address (in decimal). The keyboard should now be in DSK mode. If an unexpected reaponsa appears, such as the memory size question after executing the program, reload your tape (or the program), check the BASIC program (aspecially the data statements), and try again.

Check to see that the kayboard is indeed in DSK mode by typing asdig. The letters agalu should appear on the screen. If they don't, press the shift and zero keys (QWERTY position) down simultaneously.

The BASIC program, now having done its job, can be cleared from memory by typing NEW. The machina language ob-



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405 K/bytes of storage. Apparath as combined its Newdos/80 operating system and a dual-sided 80 track mini-floppy drive to give you 405,000 bytes of storage in a single volume. Modification patches to Newdos/80 expands the capability of single density drives, so you'll have greater applications for your TRS-80 model 1.*

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And, you can choose either an MPI or Tandon Drive Mechanism. Drives come complete with case,

power supply, interface cable and documentation including patches to Newdos/80. Either



drive mechanism is priced at only \$839 with additional drives available at \$789. At 482 bytes per buck, it just might be the answer to your storage problems.







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THE PERIPHERAL PEOPLE

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5 CLS

6 CLEAR 30

10 INPUT "DID YOU SET MEMORY SIZE"; A\$: IF LEFT\$(A\$,1)="Y GOTO 20

15 PRINT "MEMORY SIZE SHOULD BE AT LEAST 103 BYTES BELO W TOP OF MEMORY."

18 PRINT "SET MEM SIZE AND RELOAD PROGRAM.": END

20 CLS 22 PRINT"D V O R A K SIMPLIFIED KEYBO ARD"

23 PRINT"JON ETHERTON S. 222 ELM #2 SPOKANE, WA 9920

25 PRINT:PRINT THIS BASIC PROGRAM LOADS A MACHINE LANGU

30 PRINT*KEYBOARD CONVERSION PROGRAM INTO MEMORY LOCATI

40 PRINT"BY THE USER.

50 PRINT*ONCE THE PROGRAM IS ACTIVATED, THE KEYBOARD OF YOUR TRS-80

60 PRINT"CAN BE CHANGED FROM 'QUERTY' TO DSK WITH A SIN GLE KEYSTROKE"

70 PRINT "PROGRAM SIZE IS 103 BYTES"

98 PRINT"STARTING ADDRESS IS USUALLY THE SAME AS MEMORY SIZE."

95 PRINT*IF OVER 32767, THE ADDRESS WILL BE CONVERTED T O A NEGATIVE NO.

100 INPUT"WHAT IS STARTING ADDRESS (IN DECIMAL)";ST

105 'IF ST<19096 THEN PRINT MUST BE OVER 19896":GOTO 10

106 IF ST>65312 PRINT MUST BE LESS THAN 65312 GOTO 100

109 IF ST>32767 THEN S= -1*(65536-ST):ELSE S=ST

120 FOR A=S TO S+103

130 READ D

140 PRINT A,D

145 POKE A,D

160 NEXT A

170 DATA 42,22,64,34,0,0,33,0,0,34,22,64,195,25,26,205, 0,0,245,58,16

172 DATA 56,254,1,32,15,50,120,56,254,1,32,0,58,0,0,196,120,50,0,0

174 DATA 50,0,0,254,0,40,2,241,201,241,79,6,0,33,0,0,9, 126,201,0

175 DATA 0,1,2,3,4,5,6,7,0,9,10,11,12,13,14,15,16,17,10,19,20

176 DATA 21,22,23,24,25,26,27,20,29,30,31

177 DATA 32,42,34,35,36,37,36,39,46,41,33,115,67,45,66,

178 DATA 54,50,55,53,51,49,57,48,50,52,56

179 DATA 03,119,61,110,122,64,65,88,74,69,46,85,73

100 DATA 68,67,72,84,70,77,66,82,76,63,80,79,09,71,75,4 4,81,70,59,91

102 DATA 92,93,94,95,96,97,120,106,101,62,117,105,100,9 9,104,116,110,109

184 DATA 98,114,108,47,112,111,121,103,107,60,113,102,4

2000 REM ADDRESSES AND DATA TO BE CHANGED ON RELOCATION

2020 N=ST+16

2040 GOSUB 10000

2060 POKE S+4, LSB: POKE S+5, MSB

2000 N=ST+15

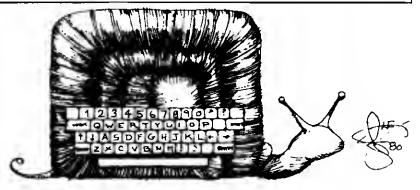
2100 GOSUB 10000

2120 POKE S+7, LSB: POKE S+0, MSB

Program continues

```
2140 N=ST+60
2160 GOSUB 10000
2100 POKE S+34, LSB: POKE S+35, MSB
2200 POKE S+39,LSB:POKE S+40,MSB
2220 POKE S+42, LSB: POKE S+43, MSB
2240 N=ST+61
2260 GOSUB 10000
2200 POKE S+55, LSB: POKE S+56, MSB
2320 PRINT "PROGRAM RELOCATED"
2330 E=A-1
2350 PRINT"ENDING ADDRESS IS ";E
2360 PRINT TO EXECUTE, TYPE 'SYSTEM', PRESS ENTER, AND
     TYPE "
2370 PRINT"'/";ST;"'. PRESSING THE SHIFT KEY AND '0' W
     ILL CHANGE
2300 PRINT"THE KEYBOARD FUNCTION."
2390 PRINT"THE LOOKUP TABLE BEGINS AT ";S+61;". ANY KE
     Y FUNCTION MAY
2400 PRINT"BE CHANGED BY POKING IN A DIFFERENT ASCII VA
2420 PRINT"TO MAKE A SYSTEM TAPE WITH T-BUG, TYPE:
2430 N=ST:GOSUB 20000
2440 S$=H$
2450 N=ST+153:GOSUB 20000
2460 E$=H$
2470 PRINT"P ";S$;" ";E$;" ";S$;" FILE NAME"
9999 END
10000 REM SPLIT POSITIVE-SIGNED ADDRESS INTO MOST AND L
     EAST SIGNIFICANT BYTES
10010 MSB=INT(N/256)
10020 LSB=((N/256)-MSB) *256
10040 RETURN
20000 'DECIMAL TO HEK CONVERSION
20010 A=N/4096
20020 D(1) = INT(A)
20030 B=(A-D(1))*16
20040 D(2)=INT(B)
20050 C=(B-D(2))*16
20060 D(3) = INT(C)
20070 D=(C-D(3))*16
20000 D(4)=INT(D)
20095 H$=""
20100 FOR I=1 TO 4
20115 IF D(I) < 10 THEN H = H + (CHR + (D(I) + 40)) ELSE H = H + (CHR + (D(I) + 40))
      (CHR$(D(I)+55))
20140 NEXT I
20150 RETURN
```

Program Listing 1.





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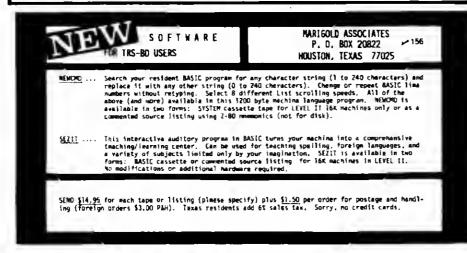
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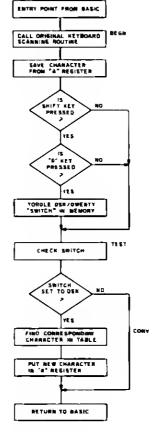
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Flow Chert

ject code remains in protected memory.

To save the program for future usa, make a system tape to load the machina code program directly. To do this, first load the program as described. It is not necessary to execute it. Write down the haxadecimal starting, ending and execution addresses which are displayed on your screen. (Starting and execution addresses are identical.)

Then load a monitor program such as T-Bug. When you get T-Bug's * prompt, load e blank tape in the recorder and type P and the starting, ending and executing addresses and DSK. DSK is the file name—or use anything you prafer up to six characters. Then press anter.

The tape should take only a few seconds to record. You might be wise to make several dumps of the program on the same tape; Simply retype the above line to start each dump.

The assembly language listing (Pro-

"The TRS-80 gets information from the keyboard by scanning eight memory locations and decoding the data into ASCII codes representing each character."

4DBC		00010		ORG	4DBCH	
4DBC	2A1640	00020	STRT	LD	HL, (4016H) ; DCB KEYBOARD ADDRESS
4DBF	22CC4D	00030		LD	(BEGN+1),	HL ; INTO CALL STATEMENT
	21CB4D	00040		LD	HL, BEGN	
4DC5	221640	00050		LD	(4016H),H	L ; INTO DCB
4DC 0	C3CCØ6	00060		JР	Ø6 CCH	; BACK TO BASIC
		00070	;			
4DCB	CD0000	00000	BEGN	CALL	Ş-Ş	ORIGINAL KEYBOARD ROUTINE
4DCE	F5	00090		PUSH	AF	;SAVE KEYBOARD CHARACTER
4DCF	3A1030	00100		LD	A, (3810H)	STROBE SHIFT KEY
4DD2	FE01	00110		CP	1	SHIFT PRESSED?
4DD4	200F	00120		JR	NZ, TEST	SKIP IF NOT PRESSED
4DD6	3A0030	00130		LD	A, (3000H)	STROBE ZERO KEY
4DD9	FE01	00140		CP	1	ZERO PRESSED?
4DDB	2000	00150		JR	NZ, TEST	;SKIP IF NOT PRESSED
4DDD	3AF64D	00160		LD		DSK OR OWERTY STATUS
	C600	00170		ADD	A,00H	; TOGGLE STATUS
4DE2	32F84D	00100		Γ D	(STAT),A	;STORE STATUS
4DE5	3AF84D	00190	TEST	LD	A, (STAT)	GET STATUS
4DEØ	FE00	00200		CP	Ø	: KEYBOARD IN DSK MODE?
4DEA	2002	00210		JR	Z, CONV	; IF YES, CONVERT TO DSK
4DEC	F1	00220		POP	AF	RESTORE NORMAL CHARACTER
4DED	C9	00230		RET		RETURN TO BASIC PROGRAM
4DEE	Fl	00240	CONV	POP	AF	RESTORE NORMAL CHARACTER
4DEF	4 F	00250		LD	C,A	SET UP INDEX
	0600	00260		LD	в,0	
4DF2	21F94D	00270		LD	HL, TBLE	:TABLE START ADDRESS
4DF5	09	00200		ADD	HL,BC	FIND CHAR IN LOOKUP TABLE
4 DF 6	7 E	00290		LD	A, (HL)	GET DSK CHARACTER
4DF7	C9	00300		RET		RETURN TO BASIC PROGRAM
4DFØ	00	00310	STAT	DEFB	Ø	; KEYBOARD MODE (Ø OR ØØH)
4DF9	00	00320		DEFB	0	BEGIN LOOKUP TABLE
4DFA	01	00330		DEFB	ī	; (TABLE IS 122 BYTES LONG)
4DFB	02	00340		DEFB	2	
4DBC		00350		END	STRT	
0000	TOTAL I	ERRORS				
				Prograi	n Listing 2.	

grem Listing 2) is intended mainly to explain the program. It is generally best to load the program with the BASIC routine.

How It Works

The TRS-80 gets information from the keyboard by scanning eight memory locations and decoding the data into ASCII codes representing each character.

The keyboard scanning progrem in ROM is set up as a subroutine which is called by BASIC continuously. The starting address of the subroutine is loaded into a reserved area of RAM called the device control block (DCB) each time the computer is turned on.

There are three DCBs—one each for the printer, keyboard and screen. By loading

ī		_		-,			
	С	or	tin	ued	to	page	78

DEC		NEW	ASCII	CODES
CODE	KEY	CHAR	DEC	HEX
0	none		0	00
1	break	same	1	01
2-7	none		2-7	02-07
8	1/c back arrow	same	8	90
7	1/c nt. annow	same	9	٥ ۶
10	1/c down arrow	same	10	0a
11	none		11	OE:
1.2	none		12	30
13	enter	Same	13	OI
1.4-23	none		14-23	0E-17
24	u/c back arrow	same	24	18
				Table continue



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25	u/c rt arrow	same	25	15
26	u/c down arrow	same	26	16
27	u/c ur arrow	same	27	1B
28-30	none	20	28-30	1C-1E
31	clear	Same	31	1F
32	SPACe	∍ane Same	32	20
33	i	⇒ ane *	42	26 26
34	ii	T Same	34	22
35	#		35	23
36	\$	same same	36	24
3 <i>7</i>	7.		37	25
38	* \$	same		
36 39	٠	same	38	26
40	,	Same	39	27
41	(รสพย	40	28
42)	58Me	41	29
	*	į	33	21
43 44	**	5	115	73 57
45	*	₩	87	57
	-	same	45	20
46	*,	V	86	56
47	/	Z	90	5A
48	0	ረ	54	36
49	1	:	58	36
50	2	7	55	37
51	3	5	53	35
52	4	3	51	3 3
53	5	1	49	31
54	<u>6</u>	9	5 <i>7</i>	39
55	7	0	48	30
56	8	2	50	32
57	9	4	52	34
58	2	8	56	38
59	Ŧ	5	83	3H
60	<	W	119	77
61	::::	same	હ1	31
42	>	V	118	7ሪ
63	?	Z	122	7A
64	@ (unshifted)	©	64	40
65	A	Α	6 5	41
66	В	X	88	58
67	C	J	74	46
68	Ti .	E	69	45
69	E		46	2E
70	F	U	85	55
71	G	I	73	45
72	Н	D	68	44
73	1	C	67	43
74	J	Н	72	48
75	K	T	84	54
			Te	able continues

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					\neg
76	L	N	<i>7</i> 8	46	-
77	M	M	77	41)	-
7B	N N	B	66	42	-
70 79	Ö	Ŕ	82	52	-
80	ř	Ĺ	76	4C	-
81	, Q	?	63	3F	-
82	R	F'	80	50	- [
83	S	ò	79	4F	-1
84	Ť	Ϋ́	89	55	
85	ບໍ່	Ġ	71	47	
86	Ÿ	ĸ	75	4E	1
8 <i>7</i>	พ	,	44	20	1
88	X	á	81	51	
89	Ŷ	F	70	46	
90	ž	;	59	31	ļ
91-95	none	•	91- 9 5	3C-3G	ĺ
96	0 upper case	@	96	60	
97	a	a	97	61	
98	b	×	120	78	
99	<u>.</u>	Ĵ	106	6A	
100	d	ë	101	65	
101	ė	>	62	3E	- 1
102	f	u	117	<i>7</i> 5	Ì
103	g	i	105	65	١
104	ħ	d	100	64	
105	i	C	99	63	
106	į	ħ	104	36	
107	k	t	116	74	
108	1	าา	110	6E	
109	M	M	109	6I)	
110	n	Þ	98	62	
111	٥	r	114	72	
112	F	1	108	6C	
113	વ	/	47	2F	
114	רו	두	112	70	
115	5	O.	111	6F	
116	t	Y	121	75	
117	u	3	103	67	
118	V	k	107	6E	
119	u	<	60	3C	
120	×	4	113	71	
121	Y'	f	102	6 <i>6</i>	
122	Z	+	43	28	
	+	able 1.			
	1.	aule I.			

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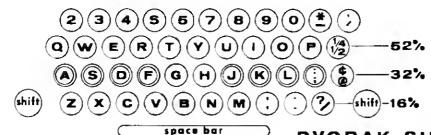
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"The first part of the program initializes the DCB and fetches the original keyboard scanning program address, which becomes the object of a call statement."

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another eddress into the DCB after turning on the power, another keyboard scanning routine can be substituted for the one in ROM, Instead of writing an entirely new routine to scan the keyboard, the original ROM is called and modified by this program.

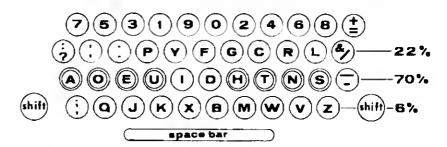
Refer to the essembly language listing, Program Listing 2. The first part of the program initializes the DCB and fetches the original keyboard scanning program address, which becomes the object of a call statement. It then jumps back to the ready message of BASIC. Jumping to location 1A19H may cause an out-of-memory response, which may be ignored. This return point will also work with Disk BASIC.

BASIC detours through the new program each time the keyboard is scanned. The first thing it does is call the original keyboard driver. If KBFIX or Disk BASIC (which includes keyboard debounce) is used, the address will be different than the 03E3H address of the routine in ROM.

The ASCII code produced for a shift zero is the same as that for the space bar; we need to decode that keypress combination directly. The routine checks for a 01 in keyboard memory locations 3810 and 3880. If both conditions are met, the value of the STAT or status location is toggled from 00 to 80H to 00.

The program then checks the status switch to see if the keyboard character should be altered. If the status location contains an 80H, the program restores the character in the A register and jumps back to the calling program in BASIC. If the stetus is 00 the cherecter is used to index a character in the lookup table (Table 1).

DVORAK SIMPLIFIED KEYBOARD



The table is similar to the one on pages C/1 and C/2 of the Level II BASIC manual.

The conversion table could be shortened by leaving out ASCII codes 0 to 32, all of the lowercase letters, and some of the punctuation cherecters. However, the indexing routine would heve to be more complex to deal with the exceptions. Also, the keyboard is purposely made as easy as possible for the end user to modify. At current discount prices, the program occupies less than \$2.00 worth of memory, so length should not be a major consideration.

To change the character produced by any key on the keyboard it is only necessary to change the data statement associated with that key. The data in lines 179-184 of the BASIC listing corresponds to the characters in the lookup table. It is also possible to change characters on the fly, then POKEing the appropriate ASCII code into the proper memory location. By adding the table starting address to the ASCII code of the original key character, you can find the memory locations now associated with that key.

For example, if the BASIC program told you that the lookup table starts at 32600 and you want to change the letter a to m,

add 32600 to 65, the ASCII code for e. If you print PEEK (32665), the computer should respond with 65. Then POKE 32665,77, the ASCII code for m and you should now see m displayed on the screen when you press the a key.

You can also POKE graphic codes 129-191 into the key locations in order to write graphics directly to the screen. Don't be surprised, though, if the graphic blocks look like BASIC keywords when you list a program containing them.

Word Process Problem

A problem arises when you want to use DSK with a machine language program such as Electric Pencil or Scripsit. The conversion program must be patched into the keyboard scanning routines of these programs, since they do not use the keyboard scanning software in BASIC ROM.

To make the keycaps reflect the DSK arrangement, it is easy to pull off the caps with a bent paperclip and put them in the desired order. If you choose to make variants of the punctuation mark placements found on the classic DSK, it would be eyepleasing to buy a set of press-on labels the seme diameter as the keys. Type the exact letters, numerals and punctuation

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"Type minimum pumpkin in QWERTY; try it quickly..."

marks on the labels before removing them from their becking. Draftsman's fixativa apray would make the tops of the labels almost as long lasting as the manufacturer's original key caps, it is also a good idea to attach stick-on labels to the key-cap fronts identifying the original QWERTY positions, for use with machine language and other programs not written with the DSK in mind.

One possible modification leaves the number keys in their numerical order. To do this, replace line 178 in the BASIC listing with the following:

178 DATA 48,49,50,51,52,53,54,56,58,57,58 Also exchange the 33 and 42 in line 177 to exchange the exclamation point and asterisk. The quastion merk is now a lowercase character, thus meking it eesier to abbreviate print in BASIC programs.

Practicable Persuasion

When you have your DSK program debugged end ready for use, consider that practicality of using each arrangement. Start with QWERTY end type federated. Note that all letters are keyed by fingers of the left hand. Now press shift zero and try the same word in DSK. (Refer to the DSK chart, Fig. 2b, but keep the same homerow finger position that you learned for QWERTY, Home-row keys are double-circled on the chart for operators who have not previously learned the touch system of typing.) It will be slow going at first, but note how federated alternates right, left, right, left. This is one of the open secrets of why DSK is highly superior.

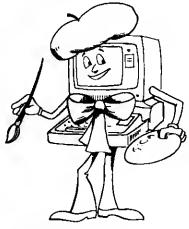
Try December In each mode-note the difference in feel es you type it in DSK. Type minimum pumpkin in QWERTY; try it quickly, with es much speed as you can muster. Now switch to DSK and, referring to the chart, type minimum pumpkin e few times slowly, noting how easily it flows on the new keyboard. After a dozen times, you will by typing as fest as you were QWERTY style.

If you haven't become intrigued by now, try copying some plain text first on QWERTY, then on DSK. You will find yourself remembering certein placements as the e and a without having to refer to the chart. You are learning DSK already! That's how easy it is.

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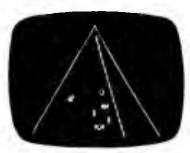
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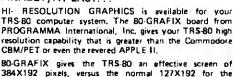
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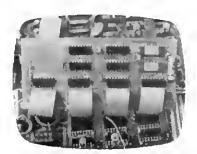
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Into the 80's

lan R. Sinclair 89 Alexandra Road Sible Hedingham Halstead, Essex CO9 3NP England

Last time, you remember we were faced with the problem of selecting a pair of words at random from our data list, doing it by running through a random number of items and discarding the ones we didn't need. All this effort wes necessary because we couldn't pick a single word at random out of the list. Now we're going to look at a method of doing that.

This method is a dern sight simpler than the name suggests. We READ the data as usual, but as each item is read we label it as a string variable, and number the variables. When we read off the first animal name, we number it as Q\$(1), and we make its answer A\$(1). Similarly, the next pair become Q\$(2) and A\$(2), the next are Q\$(3), A\$(3), etc.

Storing Variables

The computer stores these variables and refuses to be confused by eny similerities between variable names. A\$, A1\$ and A\$(1) are three separate variables which will be stored in different parts of memory and can be called up only if you use the correct titles.

Qne advantage of storing words like this is that we can retrieve any question or answer pair without having to sort through all the words. If our random choice comes up with the number two, we can then print Q\$(2), and match the answer at the INPUT stage with A\$(2). Remember that RND(6)

generates the random numbers.

A set of strings tagged with numbers in this way rejoices in the splendid title of an array of subscripted string variables. Array means a list, and subscripted means that we've tagged each item with numbers so that we can identify them.

My friends, nothing could be easier than setting up an array now that you know about the FOR.....NEXT loop. The arrey in Listing 1 starts with the FQR N = 1 TO 6 statement, which means we start with the value of the variable N set to one. The next command is READ Q\$(N), A\$(N). This reads in the first word of data and assigns it the variable name Q\$(1), because N is set to one. The next word is also read and assigned the variable name A\$(1). That's the first question and answer pair dealt with, so the next command is NEXT. This causes the computer to increase the value it has assigned to N, and compare it with the limit we set at the start, which was six. We've just increased N from one to two, so the NEXT command moves to the READ command with N set to two. The next two words are read, assigned the variable names Q\$(2) and A\$(2), the control returns to the NEXT statement, and N is set a three, and compared with six. This goas on until N hes been set to six. At this value, the last pair of quastion and answer words are read in and assigned the variable names Q\$(6) and A\$(6), when N is increased to seven by the NEXT step, and the loop is broken because seven is greater than six. All the data words have been read and converted into an array so we can pick them out as we want, using a piece of program like the one shown in Listing 2.

Dimensioning

Before you start using tagged variables, there's one more instruction you need to know. When you set up an array of tagged variables, the computer stores the variables in one part of its mamory and keaps a note of them, elong with the tags in another part. So it can organize this process efficiently, it needs to be told how many tags you might use. Might use, notice, not did use. If you specify that you might use 50 tags, but use only 20, that's all right by the TRS-80, but if you specify that you might use 50 and than try to use 51, you'll get an error message (BS) whenever you try to use the last tag, meaning that you haven't reserved enough memory space.

The number of tegs which you might use on a variable is called the dimension of the variable. If you're going to enter 12 names, assigned to L\$ and tagged L\$(1),...L\$(12), the dimension of L\$ is 12. The TRS-80 allows you to use dimensions of up to ten on any subscripted variable without any extra work, but if you are going to use more than this number of tags you have to enter the dimension early in the program, by using the DIM (for DiMension) statement.

DIM L\$(12) means that you plan to use a subscripted variable L\$ with subscript numbers which do not exceed 12. If your program has several subscripted variables, you don't need to write a separate line of DIM for each. For example, you can write DIM L\$(12), P(20). Make sure that you havan't reserved more memory space than your computer has, and make sure that the DIM statement comes early in the program, wall before you are going to use any of these subscripted variables. Remember also that you can use 0 as a subscript, so you can have L\$(0), L\$(1)...which lets you have an extra subscript without having to reserve any more memory.

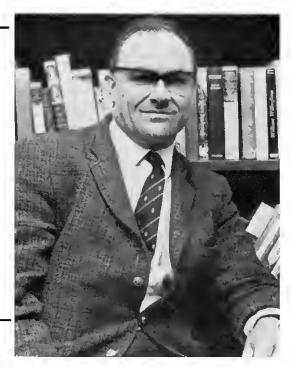
Loading the Strings

Listing 3 allows you enter word pairs

Ian Robertson Sinclair was born in 1932 in Tayport, Scotland, and educated at Madras College, St. Andrews where, needless to say, he played golf. He gredueted in 1955 with a B.Sc at the University of St. Andrews. He started writing articles for magazines in 1964 and began teaching college in 1966. His first book, Understanding Electronic Components, was published in 1972 (still in print) and he is now working on his thirtieth.

Writes Sinclair, "I bought a TRS-80 whenever a keyboard became available over here (to English TV standards) and have eaten, drunk and slept TRS-80 computing ever since."

I. R. Sinclair



from the keyboard and tag them as subscripted variables. As an added refinement, the tag number is shown alongside the word as you type it in.

This is a powerful piece of program. It starts with FOR N = 1 TO 100. I picked 100 as an upper limit, but we could have used anything alse. The point of doing this is to ensure that we don't put in more words than we've allowed for in the DIM statement.

N is set to one at the beginning, and the PRINT N: command prints a one on the screen, followed by the question merk which always goes along with the INPUT statement. The semicolon after PRINT N is there to make sure that the N and the INPUT word are on the same line. You can then type a question word, which will be assigned the variable name of Q\$(1). Follow this with a comma, and type the answer word, A\$(1) and ENTER. What happens if you forget the comma and then use EN-TER? Disaster, because the two words will simply be strung together as a single word assigned as O\$(1), and the computer will print two query marks to tell you that It's waiting for the answer word. The TRS-80 is a great little computer, but it can't correct your mistakes. If you enter each word separately, you'll get a single query mark as a prompt for the question word, and a double query mark as the prompt for the enswer word.

The next section of the line is an IF... NEXT...ELSE decision. If Q\$(n) is not assigned to X, then the next value of N is taken and another pair of words can be used. If the letter X is input, the program breaks out of the FOR...NEXT loop, and makes N take a velue one less then that assigned to it last. In this way you avoid using the value X in the program. If, for exemple, X is the tenth item which you entered, then N is reduced from ten to nine, because there are only nine actual items. We can now pick out any pair of words for our program and enter them from the keyboard. The idea of sub-

scripted string variables (you can have subscripted number variables as wall, but strings are more fun) is useful, but it can be extended.

A Matrix

Take a look at the program in Listing 4. It starts at line 10 with something which is new to you, a pair of FOR-NEXT loops together, one inside the other. This is called nested, because the first one completely surrounds the second one and the second the third (if you have one) and so on. There are two here, and they are reading what looks at first sight to be a single string variable, A\$. A\$, however, is a subscripted string variable, and it's not singly subscripted like A\$(1), but doubly subscripted like A\$(1,1). This arrangement of subscripts is set up by the use of I and J in the FOR-NEXT loops and makes for very economical programming, because in place of question string and answer string we simply have A\$. It's important but difficult to grasp if you've never used anything like it before, so we'll spend some time looking at this one close-

The first, or outside, loop starts with FOR I = 1 TO 4, so that on the first run I is given the value one. The program then moves to the second FOR instruction, and sets J at one. The READ instruction causes the first word of data to be read and labeled as A\$(1,1) because I=1 and J=1. We would normally have two separate NEXT statements, but in this type of array we can get away with the one which is shown, NEXT J,I, which means take the next J if there is one, and if there isn't, take the next I.

Notice that you have to be fussy about the order of these variables. The NEXT variables have to be in reverse order from the FOR variables, so that if the first FOR uses I, then I must be the last variable in the NEXT. If you don't do this, your nest has

holes in it. For example, if we opened with FOR X = 1 to 5: FOR Y = 1 to 4: FOR Z = 1 to 2, we would have to finish with NEXT Z,Y,X.

So far we have read the date word HORSE and assigned it as A\$(1,1). We then take the next J, keeping I at one, and so making J = 2. The next word, FOAL, is assigned the string coding A\$(1,2). Starting to look interesting?

We're out of J's now, so the next I is taken, and I now has the value of two. This time around, with I=2 and J=1 (because we sterted back at the FOR J=1 to 2 again), we'll read PIG and assign it as A\$(2,1). The inner loop will then cause PIG-LET to be read, and assigned as A\$(2,2). In fact we're assigning four sets of two words when the program has run. If you like a more abstract description, it's four lines of animals with two columns, one for parents, the other for the young. Mathematicians (may they be preserved...preferably in aspic) call this arrangement a matrix.

The nicest thing about a matrix of this sort is that it's easy to make neat arrangements. Line 30 gives you some idea of what can be done. Starting with the FOR statements which set up the matrix arrangement, it uses J in a PRINTTAB() statement to space the two columns of words neatly on the video screen. The semicolon after the A\$(I,J), makes sure that the young animal's name get printed in the same line as the old one. Follow this up with a separate PRINT command between the NEXT J and the NEXT I, or the computer will try to print everything on the same line, and fail miserably. It seems a shame to abandon that NEXT J,I aiready, but the results are quite satisfying. Run it and see!

Cutting Strings

And now, as they say, for something different. Remember, a month or so ago, when

80 Microcomputing, December 1980 - 83



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D BOX 23384 • PORTLAND, OR 97223 • (503) 620-8832 TRS 80 is a Trademark of Tandy Corp 500 FOR N=1TO6:READ Q\$(N),A\$(N):NEXT 510 FOR N=1 TO 6:PRINT Q\$(N),A\$(N):NEXT

Program Listing 1

150 DATA"LION", "PRIDE", "WHALE", "SCHOOL", "FISH", "SHOAL", "SHEEP", "FLOCK", "COWS", "HERD", "GEESE", "GAGGLE"

499 REM INTO80'S FIG. 4.2

500 FOR N=1TO6: READ Q\$(N), A\$(N): NEXT

510 R=RND(6):PRINT Q\$(R)

Program Listing 2

10 DIM Q\$(100),A\$(100)

20 FOR N=1TO100:PRINT N".";:INPUT Q\$(N),A\$(N):IF Q\$(N) < >"X" THEN NEXT ELSE N=N-1

30 FOR Y=1TO N:PRINT Q\$(Y), A\$(Y):NEXT

Program Listing 3

10 DIM A\$(6,6):FOR I=1TO4:FOR J=1TO2:READ A\$(I,J):NEXT
J,I

20 DATA "HORSE", "FOAL", "PIG", "PIGLET", "DOG", "PUPPY", "COW", "CALF"

30 FOR I=1TO4:FOR J=1TO2:PRINTTAB(20*J)A\$(I,J);:NEXT J:
PRINT:NEXT I

Program Listing 4

10 DIM L\$(50):FOR N=1TO5:INPUT L\$(N):NEXT
100 REM INTO 00'S FIG 4.5 FAULTY EXAMPLE
110 FOR N=1TO50:IF LEFT\$(L\$(N),1)<>*D*THEN NEXT
120 PRINT L\$(N):NEXT

Program Listing 5

10 DIM L\$(51):FOR N=1TO5:INPUT L\$(N):NEXT

100 REM INTO 80'S FIG 4.6

110 FOR N=1TO50:IF LEFT\$(L\$(N),1)="D" THEN PRINT L\$(N):
 NEXT:ELSE NEXT

Program Listing 6

10 DIM A\$(51):FOR N=1TO50:READ A\$(N):NEXT

20 INPUT "SURNAME"; X\$

30 L=LEN(X\$)

40 FOR N=1TO50: IF X\$<>RIGHT\$(A\$(N),L) THEN NEXT ELSE PR INT VAL(A\$(N))

50 DATA "217467003JOHN DOE", "2170322104TIM BUCK" : REM Y
OU NEED A TOTAL OF FIFTY ENTRIES!

Program Listing 7

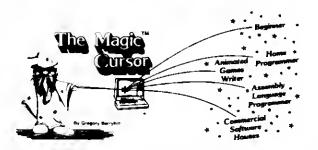
learning to recognize a string, using instructions like IF A\$ = P\$ THEN...? One of the hazards of that type of recognition is that if you print one of these string variable words with a space or a misspelling, the computer simply won't recognize it. We're now going

to look at ways around that problem, making use of three very powerful string selection instructions, LEFT\$, RIGHT\$, and MID\$. Let's take 'em slowly, one by one.

LEFT\$, as its name suggests, selects the left part of a string. You have to specify

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which string you want a chunk selected from, and how many letters you want to take. For example, suppose we have the instruction LEFT\$ (A\$,3). Whatever word is used as A\$, the instruction will select the first three letters on the left hand side. If A\$ = "HORSE", then LEFT\$ (A\$,3) gives HOR. A\$ is not affected by this, It is still HORSE. If you had spelled it as HORRES, the computer won't care if it has been instructed to look only at the first three letters. RIGHT\$ does the same sort of thing. Suppose we have the instruction RIGHTS(AS.3) and AS = RABBIT". This time BIT is selected from the word, and A\$ is still RABBIT, LEFT\$ and RIGHT\$ do not delete letters from words, they simple select which letters can be used for other purposes.

LEFT\$ and RIGHT\$ are useful weapons, but MID\$ is a real missile. To use MID\$, specify what string you want to operate on, at which letter you want to start, and how many letters you want to select. Suppose we take MID\$(A\$,2,3). If A\$ = ANTELOPE the value of the MIDS(A\$2,3) is NTE-the selection starts with the second letter and takes in three letters.

Suppose we have a list of names stored as subscripted string variables, L\$(N), which means L\$(1), L\$(2), L\$(3) and so on. How many of these names start with the letter D? No. don't sit there and count them, write a program! Something along the lines of Listing 5 might suit us very well, assuming wa've used a program to read in 50 names (is your telephone index up to date?). For each value of N, the string name has its first letter compared to D. If the string doesn't start with a D, the next one is taken, but if it does, line 120 commands a printout of the name before going to the next one. We can have two commands of NEXT. This can get us into trouble if the last name does not start with D, because in line 110, the FOR... NEXT loop will and, and line 120 will then print L\$(N), which we don't need, and asks for the NEXT again. This could cause an error report (BS), meaning that we have exceeded the dimensions we asked for.

Listing 6 shows a neater and flawless method of sorting out these D's. The IF statement sorts out the D's and prints the string, and the ELSE causes the NEXT N to be selected if there isn't a D around. The dimension is chosen to allow the NEXT command to take N to 51 without causing an error message. Now how about selecting all the phone numbers which have the same area code? Let's suppose we have 50 numbers stored in an array K(N). Not K\$? Tough luck, you can't do it. All these string commands operate only on strings, not on numbers, which is why so many programs store numbers in string form by simply entering them as strings. STR\$ converts any number variable into a string variable. For example, if we have the statement K\$ just as thoroughly as if we had written K\$ = "234" in the first place. If we have 50 number variables, K(1) through K(50), you just add the line:

FOR N = 1 TO 50: K\$(N) = STR\$(K(N)).

Watch the double set of brackets, because if you miss one, you'll get the SN error message. Now that you've got your phone numbers in the form of a subscripted string variable array (gives you a feeling of power just to say it!) you can pick off the area codes by using

AS = LEFTS (KS(N),3)

Once again, we have brackets within brackets, and you have to be sure that you've included ell of the brackets.

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"As it happens, you often want to do things with numbers which you can't do with strings..."

Pecking Strings

Suppose you stored each name and number together in one string as K\$(N). Quite a savings in memory is gained by doing this, because there's only one string to store for each name/number, instead of a separate pair of strings or a string and a number. How do we separate them so that we can print out something that looks rather more civilized than JOHN W DOE 2141673802? One neat end simple method makes use of the statement VAL.

VAL means—find the number value inside a string. It's usually used when a number has been converted into a string by using STR\$ and you now want to convert back. As it happens, you often want to do things with numbers which you can't do with strings, like multiplication, division and subtraction, for example. Addition is a bit different, and we'll be looking at what happens when we use the + signon strings in a moment.

Many computers use VAL just for converting a number string back to a number, but the TRS-80 BASIC goes one better. If you have a string which starts with a number, like 1024 SUNRISE AVENUE, you can extract the number out of the string by using VAL. If, for example, you run the little program:

10 A\$ = "1024 SUNRISE AVENUE" 20 PRINT VAL(A\$)

What is printed out is 1024, the number which the VAL statement finds at the start of the string. VAL can only find a number at the start of a string, however. If you have A\$ = JOHN DOE 2174267803, then VAL(A\$) is zero, because the number follows the letters.

This doesn't prevent you from writing your own routine, using MID\$(A\$,N,1) to strip characters off the string one by one and test their ASCII codes to find if they are numbers. The ASCII codes for numbers are 48 through 57, so you could detect numbers anywhere in the string and print them out.

To spearate numbers from names by using VAL, we have to place the number first, coding our number/name in the form of 2172677803JOHN DOE.

Listing 7 essumes that you have a set of data lines which contain your telephone number and name strings. Line 10 is straightforward—we are just reading each itam end labeling it es a string array A\$(N), allowing for 50 items. If you don't want to try 50 for starters, make it two and use just the data in line 50.

Line 20 asks for the surname of the person whose number you want typed. From what you know of computers by now, you should not be surprised to learn that your

typing of DOE had better match exactly with the DOE which you have stored in the data line!

In line 30, L = LEN(X), X\$ is the string variable assigned to the name you typed at the INPUT stage, and LEN means, measure how many characters are in this string. The answer here is three. If we know how many characters are in the surname, and that the surname is at the right hand side of the string, we can pick the surname out of A\$ in

line 40, by setting a variable L equal to the length of the name string X, and then find RIGHT\$(A\$(N),L). We could equally easily have saved a line by writing in line 40:

RIGHTS(AS(N), LEN(XS))

making sure not to leave out any of the brackets. It's a useful feature of our BASIC that we can use expressions like LEN(X\$), as well as simple numbers and variables in

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10 INPUT "NUMBER BETWEEN 1 AND 25, PLEASE"; N\$

20 NS="0"+NS

30 N\$=RIGHT\$(N\$,2)

40 PRINT N\$:GOTO10

Program Listing 8

10 IF LEFT\$(A\$,2)=LEFT\$(L\$(N),2) OR RIGHT\$(A\$,2)=RIGHT\$ (L\$(N),2) THEN PRINT "CORRECT, WELL DONE!

Program Listing 9

10 CLS:PRINTTAB(23) "THIS IS THE TITLE"

20 PRINTTAB(23) ==== == ===

Program Listing 10

10 CLS:PRINTTAB(21) "THIS IS ANOTHER TITLE"

20 PRINT TAB(21) STRING\$(21,42)

Program Listing 11

10 CLS:PRINT:PRINT

20 PRINT CHR\$(23)TAB(12)"TITLE"

30 PRINTTAB(12)STRING\$(5,42)

40 FOR N=1TO1000:NEXT

50 PRINT CHR\$(29):PRINT@304, "NEXT LINE OF MESSAGE"

Program Listing 12

10 POKE 16445.8

20 PRINT"HAPPY BIRTHDAY!":FOR N=1TO1000:NEXT

30 POKE 16445,0

40 PRINT "TO YOU..."

Program Listina 13

the RIGHT\$, LEFT\$, MID\$ and other expressions.

In line 40 each item of data is examined. and the correct number of letters on the right hand side is stripped off to compare with X\$, which might be DOE. If the last three letters are not DOE, then the next string is taken, and if the last three match up, the final part of line 40 instructs the computer to print the telephone number by taking VAL(A\$(N).

Here's another use for RIGHT\$. Suppose you have a set of numbers which lie between one and 25, and you want to put them into string form so that each has two digits. like 21, 01, 18, 06. . . If you write numbers in this way, you can put them into e string and get them back easily, because you always want the same number of characters back, two in this example. If you had these at the end of a string, you could use RIGHT\$ (A\$(N),2), for example.

Listing 8 shows how this operation of padding numbers out can be achieved. The number in this example is typed in as an answer to the INPUT query, and we take the chance to assign it to a string variable, N\$. In line 20, we redefine N\$ as being equal to one space plus the old value of N\$. When we use a + sign with two string quantities, the quantities are simply run together, or concatenated. If we had typed N\$ = "*" + N\$, then with N\$ = "2", the result would be *2. As it is, line 20 uses a zero between quote marks so that the new N\$ consists of the number we read in with a zero in front of

In line 30, we define another N\$, this time the RIGHT\$ of the N\$ with a zero in front. If that N\$ were 02, the RIGHT\$ will give 02, but if N\$ were 021, RIGHT\$ would give just 21. Either way, the number consists of just two

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characters, and can be selected again by picking off two characters from the string we put it in. Both words and numbers can be padded out in this way to a standard size (two characters, 10, 20, whatever you like so long as it doesn't exceed 255) so that they can be easily selected again.

One small problem arises here. If you have converted a number into a string by using STR\$(number), the computer will automatically put a space in front of the number to make room for a negative sign if one is needed. That way, if you use STR\$(5), you get a string which is two characters long, and STR\$(50) is three characters long, though STR\$(– 50) is also three characters long. If this might cause problems, one way out of it is to use RIGHT\$. To pad out to two characters we use:

AS(N) = RIGHTS(" " + AS(N),2)

Your numbers will be two-character strings no matter what STR\$ has done to them, but watch out for negative numbers!

Time to leave the LEFT, RIGHT, MID business, and look at other things, but before we do, look at Listing 9.

This is one answer to the word recognition part of a mailing list program. If you have the first two letters correct, the comparison is good enough. You have to use this type of recognition carefully, however, because if you have two names which start with the same letters, like ANT or ANTE-LOPE, the computer doesn't know the difference. In fact, the monkey, donkey problem is the worst you're likely to get!

Presentation

How do you underline a word you have printed on the screen?

There's no way of underlining on the same line as the letters of the word, but if there is space on the next line (make space) the problem has a solution. Listing 10 shows one solution—the title words are printed, and, on the next line, using quotation marks, type the characters of underlining. The equality sign and the asterisk are useful for this job. Big BASIC, however, offers a lazy way of underlining in the form of the STRING\$ function. STRING\$ is a statement which instructs the computer to print identical characters.

There are two ways of specifying which characters we want string together. If we type in:

PRINT STRINGS(24," = ")

the computer will print a string of 24 equality sign. Similarly, PRINTTAB(20)STRING\$ (24,"A") will produce a row of 24 A's starting

"Who is this ASCII, you ask me? It stands for American Standard Code for Information Interchanges, and it's a numbercode method of transmitting characters.

at labulator position 20. Another way makes use of the ASCII codes for the numbers, letters and characters.

Who is this ASCII, you ask me? It stands for American Standard Code for Information Interchange, and it's a number-code method of transmitting characters.

How do you find the ASCII code for a character? The hard way is to look it up in the TRS-80 manual. The easy way is to ask the computer. PRINT ASC("*") will bring up the code which represents the asterisk. We can easily find other codes.

The character which is represented by ASCII code 128 is a blank. It's not the same blank as the one which is represented by ASCII 32. It's possible to have two different blanks. If that sounds weird to you, think of this. The blank represented by 32 can be entered from the keyboard (by using the space bar), but 128 can't. When the computer finds 128 in a string, it can be instructed that this is the end of a string and the start of another. It's a useful distinction.

We can now redesign our underlining statement in line 20, using STRING\$, so it looks like Listing 11. There's no reason for these two statements not going into one line, saving memory. Each time you start a new line, you use five bytes of memory, so it pays well to pack the lines as much as possible this way.

CHR\$ stands for the character or action represented by the number in brackets tollowing CHR\$. For example, PRINT CHR\$(68) causes a D to be printed because 68 is the ASCII code for the letter D. Of course, there's a catch: A lot of ASCII codes don't represent letters. They represent actions, and we can have the computer carry them out by using the PRINT CHR\$() command.

One pair of codes which are peculiar to the TRS-80 are 23 and 28. PRINT CHR\$(23) causes the display to print double-size letters and numbers until the command is cancelled by one of a variety of methods. After CHR\$(23) has been printed, we have to be careful how we use TAB and PRINT@ numbers because with double-size characters, there are only 32 characters per line.

A command to PRINTTAB(35) isn't going to produce a letter in the middle of the screen. In the same way, the PRINT@ Instructions go only to 256, not to 1023.

256, not to 1023.

Double-sized lettering is excellent for titles and for drawing attention to error messages, but the uses suggested in the manual are limited. The character size returns to normal when the CLEAR key is pressed, or CLS used

Sometimes you don't want to lose what has been printed in the large characters, yet you want more lettering on the screen in smaller print. You can't have a mixture of large and small letters. The PRINT CHR\$(23) command operates on the part of the memory which stores the video display characters, and attects either none of it, or all of it at once. One method I use in my own programs is shown in Listing 12.

Line ten skips the first line of the screen. It could be done just as easily by using a PRINT command in line 20, but we're opted to use TAB. The CHR\$(23) sets up the big letters, and we print the title and underline it. Line 40 simply arranges a time delay so we can sit back and in line 50, the PRINT CHR\$(28) then restores the lettering to normal size. It was not intended as a way of restoring normal size letters but as a method of wiping out the top line! The top line was left blank as it will otherwise be wiped clean by the PRINT CHR\$(28) command.

Notice also that the lettering which was printed double-size is now normal size but double spaced. It still looks good as a title.

We've also had to position the next line using PRINT@ to keep out of the way and avoid wiping out any other lines.

Another way of getting double-spaced print and returning again uses the instruction POKE. The method is shown in Listing 13. We'll deal with the POKE instruction later; all we need to know for now is that it can change the contents of the memory directly, and more quickly than the usual BASIC instructions. You can mix these commands, using PRINT CHR\$(23) to start the big print, and POKE 16445,0 to stop it. For some curious reeson, however, the stop command does not work in every program. I have one program in which POKE 16445,0 works perfectly, and another in which it has no effect. I still haven't discovered why.

The sharp-eyed folks will already have sensed that there's more to tell about the PRINT CHR\$() instruction. It's not particularly useful for printing letters or even punc-

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"... what they don't tell you in the instruction manual is as important and as useful as what they do tell you..."

tuation marks. It's just as easy (and easier to follow) if you just type PRINT A or PRINT; or whatever. CHR\$() has been found useful for producing effects in a program which we can't get directly from the keyboard, such as the CHR\$(23) end CHR\$(28). Table 1 shows more of these effects taken from the Level II manual.

There are a lot of ASCII codes which can't be entered from the keyboard but which make their appearance in many programs. These are the graphics characters. One unit of memory, a byte, can store a number of size up to 255; since the highest number of ASCII code for letters or characters is 128, however, that leeves e large number of unused codes. In the TRS-80 these are used for graphics characters. The later Level II manuals include a printout of these characters, but the earlier manuals didn't. For everyone who is now struggling with an old manual, Fig. 1 shows what the graphics characters look like, with their code numbers. To see any of these characters for yourself, look up its code number. Use the command PRINT CHR\$(number).

Bigger Graphics

Going onto Sinclair's Second Law - that what they don't tell you in an instruction manual is as important and as useful as what they do tell you - you may have sensed that there's a lot more to this business. It you look at Fig. 2 more is revealed. Each printing position on the video screen consists of six small blocks or cells, and the graphics characters are formed by lighting up various combinations of these cells. Why shouldn't we light up more than one cell at a time in a given block? And there's

Code	Function
0-7	None
8	Backspaces and erases current character
9	None
10-13	Carriage returns
14	Turns on cursor
15	Turns of cursor
16-22	None
23	Converts to 32 character mode
24	Backspace - Cursor
25	Advance → Cursor
26	Downward I linefeed
27	Upward † linefeed
28	Home, return cursor to display position(0,0)
29	Move cursor to beginning of line
30	Ereses to the end of the line
31	Clear to the end of the frame

Table 1. C/Control, Graphics and ASCII Codes—Control Codes 1#31

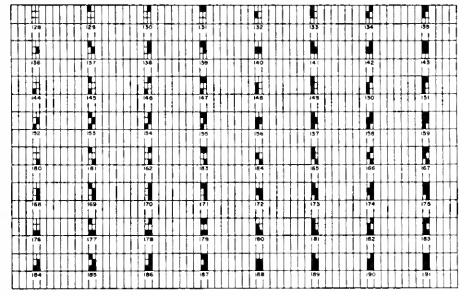


Figure 1

also no reason why we shouldn't light up more than one block at a time. We can do this by combining codes; Listing 14 shows an example. G\$ is defined as the combination of two graphics characters. Each time we command PRINT G\$, we'll get that combination, and we can, of course, use the usual printing options of PRINTTAB() G\$ and PRINT@, G\$ to position the set of characters where we want them. We can also use tricks like defining two sets of graphics characters, G\$ and H\$, and then writing

PRINT@N,G\$:PRINT@(N + 1),H\$

which will print the two sets side by side, starting at the position set by the value of the number N (between 0 and 1022).

Alternately we can use:

PRINT@N,GS:PRINT@(N+64),H\$

which will print G\$ at position N, and H\$ directly underneath it. Adding 64 to N moves the printing position to the line space immediately below, since we now have 64 print positions in a line. When we used large print we used only 32 characters per line, and there are 64 in the program now.

Next month we'll be looking at the SET and RESET commands, which are a free reign way of creating shapes. Then in the final section of this series we'll investigate the POKE command which can speed up the process of drawing shapes.

INKEYS

INKEY\$ can make your program a lot more interesting, it's always by a statement like

KS = INKEYS

What is INKEY\$? It refers to the value of the character which is fed into the computer when pressing the key just as the computer is scanning the keyboard contacts looking for a key being closed. This scanning takes places continuously when the computer is being used to enter a program. and during much of the time when a program is running in order to detect the BREAK key being pressed. It is halted during a CLOAD or CSAVE, an LLIST or LPRINT. You can't affect what goes on during these operations by punching keys. The RESET button slone, located at the back of the computer, will stop a CLOAD or CSAVE (and will usually corrupt the tape as well). Incidentally, having the continuous keyboard scan means that if you are using a simple keyboard delay routine as a bounce fix, your programs are running slower!

This scan operation is fast but chances

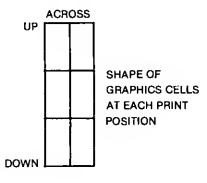


Figure 2

10 G\$=CHR\$(153)+CHR\$(166)
20 CLS:PRINT G\$
30 PRINTTAB(32)G\$
40 PRINT@350,G\$
50 END
100 REM TYPE RUN 100 TO RUN THIS ONE
110 G\$=CHR\$(154)+CHR\$(165):H\$=CHR\$(103)+CHR\$(107)
120 CLS:PRINT@150,G\$;:PRINT@155,H\$
130 FOR N=1TO1000:NEXT
140 CLS:PRINT @400,G\$:PRINT@544,H\$

Progrem Listing 14

5 PRINT "PRESS ANY LETTER OR NUMBER KEY"
10 K\$=INKEY\$:IF K\$="" THEN 10
20 K=VAL(K\$): IF K=0 THEN PRINT YOU ENTERED THE LETTER
";K\$
30 IF K<>0 THEN PRINT "YOU ENTERED THE NUMBER "; K\$
40 END

Program Listing 15

1000 A\$=""

1010 K\$=INKEY\$:IF K\$="" THEN 1010 ELSE PRINT K\$;

1020 A\$=A\$+K\$:IF LEN(A\$)<2 TREN 1010

1030 IF LEN(A\$)=2 AND A\$="NO" THEN M=2:GOTO2000

1040 IF LEN(A\$)=3 AND A\$="YES" THEN M=1:GOTO2000

1050 IF LEN(A\$)=2 THEN 1010

1060 IF LEN(A\$)>3 OR A\$<>"NO" OR A\$<>"YES" THEN GOTO201

0

1070 END

2000 IF M=1 THEN PRINT " THE ANSWER IS YES":ELSE PRINT

" THE ANSWER IS NO"

2005 END

2010 PRINT " YOU HAVE MADE A MISTAKE- PLEASE TRY AGAIN

"":FOR N=1TO500:NEXT:GOTO1000

Program Listing 16

are, if you just wrote K\$ = INKEY\$ into a program and let it run, there wouldn't be a key pressed down at the instant when that line of program was carried out, so K\$ would be a blank string at first. We get around this by looping around the instruction; forcing it to repeat itself until something is entered by pressing a key. A line such as:

50 KS = INKEYS: IF KS = " " THEN 50

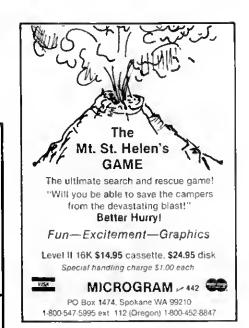
does just that. If the value of K\$ is a blank, the line runs again. It keeps running until a value is entered from a key. The value of that key is then stored as K\$. If the key is just a letter key or a number key, its value can be printed by making the line read

50 K\$ = INKEYS: IF K\$ = " " THEN 50 ELSE PRINT K\$

This is a useful way of entering letters or numbers without hitting ENTER. An example of this sort of thing is shown in Listing 15. In line 10, K\$ is set equal to INKEY\$, and looped back waiting for a key to be pressed, the number value of K\$ is found by using K = VAL(K\$). If the key is a letter key, its number value is zero, and the message in line 20 is printed. If the key is a number key, its number value is not zero (unless it is the zero key) and the message in line 30 is printed.

Take a look at the program in Listing 16. This is useful for YES/NO choices, because it lets you see the word build up on the screen, and returns at once when the correct word is selected, without needing to hit ENTER. In addition, it signals back to the main program what has been typed, using M=1 to mean YES and M=0 to mean NO. Try it out, and then think how it might be improved. Perhaps a flashing a sterisk or dash to remind when you need enter another letter?

Next month, we will look at how the TRS-80 makes calculations, formulae and logic easy for us.







AUTO-DIALER (& M - elohabetized

You'll be one after reading this introductory lesson on arrays. Comes complete with homework.

A Manipulative Wizard

John D. Adams 13126 Tripoli Ave. Sylmer, CA 91342

The TRS-80 is a talented little machine. As you learn about it, its possibilities widen surprisingly. And when it comes to handling large data groups with items in special relation to others, it is, indeed, an electronic wizard!

Anyone who has data that must be manipulated should be familiar with the array capability of the computer.

Moving from Level I, where arrays are severely limited, to II is tike moving from a Tonka toy to a Mack Truck. The Level II manual has a good section on arrays—if you already know about them. My first attempts to use it were frustrating and confusing because it is somewhat skimpy on details. I learned the hard way—by trial and error.

Аптауз

So what is an array? An array is a formal, structured arrangement of information in which individual items of data are related. Gosh, that sounds grim! Is this going to be another one of those articles? Nope. Let's take it from the top.

Everyone deals with arrays of one sort or another. Your telephone book is en array. For any page the seventeenth name from the top will correspond with the seventeenth number from the top. A street atlas is a different kind of array. If the map area you are looking for can be found on page 36 with

horizontal coordinate E and vertical coordinate 5, then that area has an array location of 36,E,5. Financial reports, bank statements, income tax tables and bills are ell arrays. They all have "grouped" information.

How does the computer handle arrays? If you have spant 15 minutes plus with your computer, you know how finicky it is about directions. A quick review of some facts concerning computer memory locations is worthwhile.

The manual explains that a single letter may be used to designate a memory location. With 26 letters in the alphabet, that creates 26 memory locations. Next, the manual states that a single letter and a single digit, such as R4, can be used. With ten digits from 0 to 9, 260 more memory locations can be designated. Finally, two letters, such as EM, can be used to name another 676 locations.

Although this accounts neatly for more than 900 memory locations, it is not quite as generous es it eppears. It would be relatively easy to fill all the locations with data, leaving no location in memory for program use. Storing data in this fashion also costs time and space—and locating information can be a nightmare. Think about designing a routine to locate a particular item by scanning all 962 locations beginning with A and ending at Z, then A0 to Z9, and finally AA to ZZ.

Arrays handle data storege by using specialized location names, and make storing, searching end retrieving information almost effortless. They do this using "subscripted" variables.

The character set used in the TRS-80 has no small numbers to use as exponents or subscripts. Exponents are expressed by the up arrow. Subscripts are enclosed in parentheses. For example, if an array is set under

the variable M, then M(1) could represent the first item, or "element," in the array, M(27) the 27th, and so forth. (Zero is usable as a subscript and should be used unless you went the location number and the item number to be the same.) A(1), A, A1, A\$, A1\$ and AA are all different memory locations.

Your data can be stored without touching the standard memory locations. By using a loop, the entire list can be searched quickly for a particular bit of data. When there is more than one type of data to be stored, multi-dimensional arrays or several arrays can be set up so that information in A(5) will correspond to information in B(5), which will correspond to information in C(5), etc.

The simplest type of array, a "one-dimensional" arrey, is sometimes called a list, because that's exactly what it is. Let's assume you want to store 11 names. On power up the TRS-80 has 11 locations sat aside automatically so you do not have to "dimension" the array (which will be discussed later).

There are several ways in which this can be handled. One alternative would be to store each name in a separate memory location. Should the names be alphabetized? Putting things in alphabetical order is a convention designed to make things easier for humans. The computer really doesn't care. It will take the same time to retrieve all 11 names either way. If you do want the names in alphabetical order, the computer will do that for you too. Names loaded in this feshion might look something like this:

10 A1\$ = "Burke, Samuel"
20 A2\$ = "Caldwell, Louise"

90 A9\$ = "Smith, Walter"

100 B1\$ = "Thomes, Anne"

110 B2\$ = "Young, Denise"

"Probably the nicest feature of an array is...to search out a particular feature without fuss..."

Aggravation abounds in this system. Each time you enter a name, you must enter the line number, the variable name, an equals sign and the name in quotes. Doing this with 500 names could cause temporary insanity. Entering 11 names taken at random from the phone book in this fashion used up 304 bytes of RAM, or slightly less than 28 bytes per name. This means that in a 16K machine with 15,527 available bytes, entering 561 names will shoot your RAM. Retrieving a name from this list would be another headache, requiring a comparison between a string and each location.

Now is the time to call the array into function. Loading an array is usually done with a FOR-NEXT loop. Having chosen N\$ as the variable name for an array, prepare a loading routine that looks like this:

```
10 CLEAR 150
20 FOR X = 0 TO 10
30 INPUT"ENTER NAME":N$(X)
40 NEXT X
```

Line 10 clears enough string space for the names. Allowing an average of 15 or 16 spaces per name should suffice. Be sure to put all CLEAR instructions at the very beginning of your program. If the computer encounters a CLEAR after data has been entered, it will callously throw out your data. Line 20 originates the loop and sets the value in X to zero. Line 30 stops execution so you can enter a name, then stores the name In N\$(X). At this point the location is N\$(0). Line 40 returns execution to line 20 and increments the value in X by one. This Indicates that on the next pass the second name will be stored in N\$(1). When the value in X is greater than ten, execution skips to the line following the NEXT instruction. Now then, that's not too difficult, is it?

Enter the lines and run them. They only use 50 bytes of RAM. All you need to do to enter the names is to type them when requested. However, if you enter names with commas in them, the computer misunderstands. It will load what precedes the comma, regard the comma as a data separator and display ?EXTRA IGNORED. This is no big problem: Enter first names first with no commas, or keep the alphabetical order and commas by entering the names within quotes. (When I loaded the same 11 names in this manner, I used only 153 bytes, saving 151 over the original 304.)

Getting the computer to give you back the data is just as simple. Add the following lines:

> 50 FOR X = 0 TO 10 60 (L)PRINT NS(X) 70 NEXT X

The procedure is just about the same ex-

cept that line 60 gets data out whereas line 30 puts it in. The (L) in line 60 is for outputting to a printer. If you want a listing on the monitor, omit the (L).

Nicest Feature

Probably the nicest feature of an array is that it enables us to search out a particular item without fuss or bother. Here is a routine for retrieving and printing a particular name; add it to the previous lines.

```
80 INPUT"ENTER NAME TO BE FOUND";S$
90 FOR X = 0 TO 10
100 IF S$ = N$(X) THEN 130
110 NEXT X
120 PRINT"NAME NOT ON LIST":GOTO 80
130 (L)PRINT N$(X)
```

Line 80 allows you to enter the name you want and put it into \$\$. Lines 90 through 110 compare it with each name on the list. If the name can't be found, line 120 is printed and you are returned to line 80 for another try. If the name is found, line 100 sends execution

to line 130 for printing.

An input loop, an output loop and a search loop make up the skeleton of any array program. Arrays can get a lot more complex, but basically they are all built on this framework.

The three loops used above can be put together in a working program designed to store, print and search an 11-name array. The program is given in Listing 1 with some CLS's and PRINT's to format the material on the monitor screen. Lines 20 and 30 give the user a choice, and some GOTO's were

```
Store Jan. Feb. March

1 $328.14 $127.40 $552.13

2 67.18 330.12 220.90

3 703.58 941.30 128.58

Table 1.
```

```
10 CLS:CLEAR 150:PRINT"NAME LIST":PRINT
20 INPUT"OO YOU WANT TO (1) LOAD (2) PRINT OUT (3) SEAR
CH";Y
30 ON Y COTO 40,70,95
40 FOR X=0 TO 10
50 INPUT"ENTER NAME";NS(X)
60 NEXT:CLS:COTO 20
70 CLS:FOR X=0 TO 10
80 PRINT NS(X)
90 NEXT:PRINT:INPUT"PRESS ENTER TO CONTINUE";CS:CLS:GOT
O 20
95 CLS
100 INPUT"ENTER NAME TO BE FOUND";S$
110 FOR X=0 TO 10
120 IF SS=NS(X) THEN 150
130 NEXT
140 PRINT NAME NOT ON LIST":GOTO 100
150 PRINT NS(X):GOTO 20
160 REM * END OF LISTING * 1 - NAME LIST *
```

Listing 1. Name List

```
10 CLS:CLEAN 2880:DIM NS(38),AS(38),CS(38),ZS(38),TS(38)

20 PRINT"ADDRESS BOOK":PRINT

30 INPUT"DO YOU WANT TO (1) LOAD (2) PRINT OUT (3) SEAR CH";Y

40 ON Y COTO 50,118,148

50 FOR X=8 TO 29

60 INPUT"ENTER NAME",NS(X)

70 INPUT"ENTER ADDRESS";AS(X)

75 INPUT"ENTER CITY AND STATE";CS(X)

80 INPUT"ENTER ZIP CODE";ZS(X)

90 INPUT"ENTER TELEPHONE NUMBER";TS(X)

100 CLS:NEXT:COTO 38

110 FOR X=8 TO 29

120 LPRINTNS(X):LPRINT AS(X):LPRINT CS(X),ZS(X):LPRINT"
PHONE ";TS(X):LPRINT

137 NEXT:COTO 38

148 INPUT"ENTER NAME TO BE FOUND";SS

150 FOR X=8 TO 29

160 IF SS=NS(X) THEN 190

170 NEXT

180 PRINT"NAME HOT ON LIST":COTO 148

190 LPRINT NS(X):LPRINT AS(X):LPRINT CS(X),ZS(X):LPRINT
"PHONE ";TS(X)

200 GOTO 30
```

Listing 2. Address Book



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added to bring you back to convenient places. But look at lines 40 to 60, lines 100 to 150 and lines 70 to 90 and you will see the three basic modules, an input loop, a search loop and an output loop.

What happens it we have more than 11 names, say 50? Try changing lines 40, 70 and 110 to read "FOR X=0 TO 49". When you run the program the monitor will show ?BS ERROR IN 40. (No—the letters stand for beyond subscript.)

Remember that the TRS-80 sets aside space for an 11-element, or member, arrey on power up. For larger arrays you must use the DIM(n) statement. To store 50 names, the statement:DIM N\$(50) must be added to line 10, as well as changing lines 40, 70 and 110. Otherwise the program remains the same. The DIM(n) statement merely reserves space, or dimensions arrays having more than 11 elements.

This basic program can be enlarged to contain not only names, but addresses, zip codes and telephone numbers. You will still be using one-dimensional arrays, but we will be using five of them: N\$ for names, A\$ for street numbers, C\$ for cities and states, Z\$ for zips and T\$ for phone numbers. Listing 2, Address Book, shows a program like this that will handle 30 names.

Examine it cerefully and compare it with Listing 1. Note the similarity of structure. Isolate the three besic routines. Instead of handling one array, the loops are now handling five. Enter the program and RUN it. Try changing it to search for an address instead, or a phone number or a city and state. Such changes are minor and easy to make.

Multi-Dimensional Arraya

Now we can forge ahead to arrays which are complex—and more useful. Five arrays were used in Address Book; one for each information item. There are good reasons not to simply load all of the information into one array such as N\$. First, the strings must be identical for the computer to match them. If all of the information was loaded under N\$, the only way for the computer to find an item would be to enter it exactly as it was originally loaded. If you had all that information at hand, you wouldn't need the program. More important, listing the data under one variable name would have seriously hempered the data search. There would have been no way to find en address. from a phone number, and no way to find people who live in the same zip code or telephone area. Using the five arrays gives a flexibility in searching techniques, and Is pertinent to arrays which have more than one dimension.

To explore the two dimensional array use

The monay amounts in Table 1 are given in the two categories of store end month. There are consequently three rows and three columns of date. (The store numbers could be considered as another column, if needed.) To find a particular figure use the row and column. For example, the figure for the second store in the third month will be found in the second row and the third column.

Using the figures in the tebie, you can set up what is called a three by three array. This is a two-dimensional array. Whereas the capacity of a single dimension array is the lest number used as a subscript, the capacity of this erray will be the product of its dimensions. That is, $3 \cdot 3 = 9$ available locations. Arreys of this type are quickly loeded, printed out and searched by using "nested" loops. The array will be given the name A, S will be used to represent the stores and M to represent the months. Note that these are not string locations (such as A\$). Numbers loaded into string locations ere regarded as symbols and not as values. Using these varieble names, the array will have the name A(S,M). A routine for loading deta would be as follows:

- 10 FOR S = 1 TO 3
- 20 FOR M = 1 TO 3
- 30 PRINT"ENTER FIGURE FOR STORE";S;"MONTH";M
- 40 INPUT A(S,M)
- 50 NEXT M
- 60 NEXT S

There are two loops here, one contained inside, or nested, within the other. Operation of nested loops is not complicated. Lines 10 and 20 originate the loops and set the values in S and M to one. Line 30 asks for information and requests information for the particular store and month represented by S and M. Line 40 deposits that information into location A(S,M) which is presently A(1,1). Line 50 returns execution to line 20 and increments M by one. When M is greater then three, execution skips to line 60. The NEXT instruction sends the computer back to line 10, which increments S by one and starts the nested loop working again.

Do you see that the nested loop (M) has to cycle three times before S is incremented? This produces subscript values (1,1), (1,2) and (1,3). After the value of S is incremented, the interior loop cycles three times again, producing values of (2,1), (2,2) and (2,3). The third and final pass generates values of (3,1), (3,2) and (3,3). You now have set nine locations with subscript values from (1,1) to (3,3).

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"You were rather limited in search abilities for Address Book. But look what you can do now..."

4K of RAM, I am very stingy with memory space. You can streamline this program using a couple of the features of the TRS-80. First you can write multiple lines separated by colons to combine lines 10 and 20, lines 30 and 40 and lines 50 and 60. Then, Level II allows you to use NEXT without a variable name. As long as the loops are nested properly the computer will know where to go. The compressed version follows:

10 FOR S = 1 TO 3:FOR M = 1 TO 3

20 PRINT"ENTER FIGURE FOR STORE";S;"MONTH";M: INPUT A(S,M)

30 NEXT:NEXT

When programs get long, a byte saved is a program earned (finished).

Enter the three lines and RUN them. The computer asks for exactly what it wants. then tucks the data into the right place and asks for more. Finally it is doing things my calculator can't.

To get a printout add the following lines:

- 40 Same as line 10
- 50 PRINT A(S.M)
- 60 Same as line 30

Try ending line 50 with a semicolon or a comma. Fool around with the PRINT@, PRINT TAB and/or PRINT USING instructions in conjunction with the printout routine. It's a snap to get neat, professional results.

You were rather limited in search abilities for Address Book. But look what you can do now:

- 1. To find return amounts for store 3 in the second month, enter PRINT A(3,2)
- 2. To find total returns for store 2 for all three months, enter PRINT A(2,1) + A(2,2) + A(2,3)
- 3. To find total returns for all three stores in February, enter PRINT A(2,1) + A(2,2) +
- 4. To find the difference in returns of store 1 in March and January, enter PRINT A(1,3) -

Getting a hint of the possibilities? Simple routines can be written to do all of these things. Here is a routine to find the total amount returned by eli stores over the three month period:

- 100 FOR S = 1 TO 3:FOR M = 1 TO 3
- 110 T = T + A(S,M)
- 120 NEXT:NEXT
- 130 PRINT"TOTAL THREE MONTH RETURNS FOR ALL STORES":T

How about a routine to find the store with the most returns for the whole period?

- 100 FOR S = 1 TO 3:FOR M = 1 TO 3
- 110 IF A(S,M)>G THEN G = A(S,M):S1 = S:M1 = M
- 120 NEXT:NEXT
- 130 PRINT"STORE #":S1:"HAD THE GREATEST RE-TURNS IN MONTH NUMBER";M1

At the end of line 110, S1 is set to the value of S and M1 is set to the value of M. This is a reminder which store and month had the greatest amount for use at the end of the routine.

These lines merely scratch the surface of what multi-dimensional arrays can do. With larger groups of data, the flexibility and convenience is easy to imagine. I repeat that, due to the number of elements in the examples, the DIM statement was not needed. For an array with 20 rows and 18 columns, the statement DIM A(20,18) would have to be inserted before using the array. This simple statement would provide 360 tocations.

Visualizing arrays with more than two dimensions is sometimes difficult. Consider the following: A financial report is presented in four volumes (one for each zone). Each volume has one page per district end the greatest number of pages in any volume is seven. Each page has a row for each store and the greatest number of rows on any page is 12. There are three columns of data for each store. To find a particular figure you must use four directions; volume number; page number; row, and column. Storing this data would require a four-dimension arrey such as T(V,P,R,C), in which the individual values would be set at T(4,7,12,3). The loading loop would look like this:

- 10 DIM T(4,7,12,3)
- 20 FOR V = 1 TO 4:FOR P = 1 TO 7:FOR R = 1 TO 12: FOR C = 1 TO 3
- 30 INPUT T(V,P,R,C)
- 40 NEXT:NEXT:NEXT:NEXT

Nested loops always end in reverse order. If they are out of order, the computer will locate to the wrong place and the program will crash. With Level II it's best to drop the loop names and let the computer figure It. That's what It gets paid for. Before you try the above routine, however, I must

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"You should have known that you couldn't get out of here without homework."

warn you that it provides 4-7-12-3 or 1008 locations. Putting in data might consume some time. If you want to try it out quickly, change line 30 to read:

30 X = X + 1;T(V,P,R,C) = X

This will store consecutive numbers from one to 1008 in sequence in the various locations. Use the following to get a printout:

- 50 FOR V = 1 TO 4:FOR P = 1 TO 7:FOR R = 1 TO 12:FOR C = 1 TO 3
- 50 PRINT"THE VALUE IN VOLUME";V;"PAGE";P;"ROW"; R;"COLUMN";C;"IS";T(V,P,R,C)

70 NEXT:NEXT:NEXT:NEXT

It will take about 25 seconds for the numbers to load, and then almost two minutes to print out all the information even though it is scrolling rapidly up the screen. The search possibilities are varied. Listing 3 is only one example. Line 30 loads random numbers between one and 5,000 in all of the 1008 array locations. Line 60 searches all the locations for the largest number. After all locations are searched, line 80 prints out the result.

I could ramble on about complex errays.

but when you reach the point where everything in Listing 3 is clear, you won't need any more help. The best way to learn is to experiment. You should have known that you couldn't get out of here without homework. Here is your assignment:

- 1. Find out if the largest number is generated more than once, and if so, how many times
- 2. Print the location(s) in which the largest number appears.
- 3. Find out if the number 238 appears in the stored numbers, and if so, where it is stored.

Taboos

There are some taboos connected with array usage. The most frequent is forgetting to dimension the array with the DIM statement when needed. This will give you the old ?BS error message.

Once an array has been set, you may not re-dimension it. If you try, you will get a ?DD error message (One of my students maintains this stands for "dumb dimensioning."). Set arrays correctly the first time and put them near the beginning of your pro-

- 10 CLS:OIM T(4,7,12,3):PRINT @ 456, "HANG ON THIS WILL TAKE ABOUT 50 SECONDS!" 20 FOR V=1 TO 4:FOR P=1 TO 7:FOR R=1 TO 12:FOR C=1 TO 3 30 T(V,P,R,C) = RNO(5000)

- 40 NEXT: NEXT: NEXT: NEXT

Listina 3

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"The only real way to learn about arrays and matrices is to use them. So onward and upward..."

gram. There are methods of transposing figures from one array to another (see the third subroutine on page 6/5 of your manual), but this is a tricky process.

Before closing, some mention should be made of matrix operations. In algebra, tables of date are called matrices. A special branch of algebra deels with manipulating matrix information. If you are in e position to need scalar multiplication, element-wise functions and the like, you surely know anough to use the subroutines on pages 6/4 to 6/6 of your manual.

To demonstrate a simpler use of matrices, that of matrix addition, you should first construct another table like the Merchandise Returned table for the previous year and with different figures. The program given in Listing 4 will load date for the first year in A(S,M), load data for the second year in B(S,M) and then add the individual elements in both matrices. Lines 10 to 40 toad the first matrix, lines 50 to 80 load the second and lines 90 to 110 do the addition. This creates a new matrix, C(S,M) to store the sums. Instructions are included in the program to format the printout. The new loca-

tion C(1,1) contains the sum of locations A(1,1) and B(1,1). All other locations follow the same pattern.

This short tour of arrays is certainly not meant to pass as a complete treatment. It is

meant to help you get from one place to another, and if it does, well and good. The only real way to learn about arrays and matrices is to use them. So onward and upward—make yourself some outrageous arrays.

```
18 CLS:PRINT"FIRST YEAR"
28 FOR S=1 TO 3:FOR H=1 TO 3
38 PRINT"ENTER FIGURE FOR STORE";S; "MONTH";M:INPUT A(S, M)
48 NEXT:NEXT
58 CLS:PRINT"SECOND YEAR":PRINT
68 FOR S=1 TO 3:FOR M=1 TO 3
78 PRINT"ENTER FIGURE FOR STORE";S; "MONTH";M:INPUT B(S, M)
88 NEXT:NEXT
98 FOR S=1 TO 3:FOR M=1 TO 3
188 C(S,M) = A(S,M) + B(S,M)
119 NEXT:NEXT
120 FS="$58,$#$.#$"
130 CLS:PRINT"THE COMBINED FIGURES ARE SHOWN BELOW:"
140 PRINT:PRINTTAB(30)"JANUARY";TAB(40)"FEBRUARY";TAB(5 0)"MARCH":PRINT
158 FOR S=1 TO 3
169 J=27
170 PRINT"STORE $";S;
188 FOR M=1 TO 3
199 PRINTTSTORE $";S;
189 FOR M=1 TO 3
199 PRINTTAB(J)USINGFS;C(S,M);:J=J+18
288 NEXT:PRINT ":NEXT

Listing 4
```

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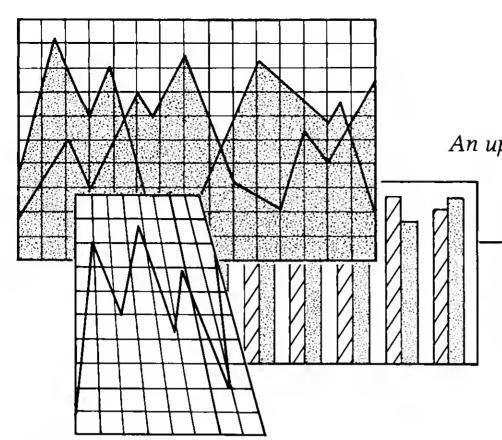
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Because I believe a review should contain some recommendation, I'll tell you up front that the Radio Shack statistical package is good and worth the price. The Creative Computing package promises much, but fails to deliver.

The Radio Shack package comes in an $8\frac{1}{2} \times 11$ three-ring binder, which contains a 170-page user manual and eight cassettes, including one blank. The Creative Computing package, in an $8\frac{1}{2} \times 5\frac{1}{2}$ vinyl folder, contains a 27-page user booklet and one cassette

The Radio Shack software supports printed output. The manual includes a sample of the video display at each program stage and a discussion of possible error messages and other user foul-ups. The

manual also has tour appendices, one containing program listings.

The Creative Computing booklet only describes how to use the statistical programs.

CLOAD Cassettes

A short digression: I recommend that you recopy the Creative Computing programs onto another cassette. On the original cassette, the programs are recorded one after the other, so if you wish to use the seventh program, you must CLOAD seven times. Copy the programs onto another cassette and give each a unique file name. Or load each onto one side of a single cassette.

Writing this review, I discovered that the programs on the Advanced Statistics cassette do have file names. This is not mentioned in Creative's booklet. The file names are not the numbers one to nine as you might expect, but the letters A to I. So, to load the Multiple Linear Regression program (number 6 on the table of contents), you would type CLOAD F. This works only it you start from the beginning of the tape.

The Programs

Both packages contain roughly equivalent statistical programs. The Radio Shack package contains two programs that are absent from the Creative Computing package, and the Creative peckage contains one program that is not in Radio Shack's. The Radio Shack Random Sample program selects a random sample of data item numbers from a population. The second program is Time Series II. If calculates seasonal indices and moving averages for yearly, quarterly, monthly, weekly or daily data. In

my work I find little use for the random sample program, but the Time Series II is invaluable.

The extra program in the Creative Computing package is Correlation Analysis. It performs correlation analysis on up to five variables. The statistical output of the program is similar to that of the multiple regression program, but may prove to be useful to users who need correlation analysis.

While the remaining programs in both packages are similar, differences exist and will be covered in the following discussion.

Most of the programs do not contain data correction routines. To minimize your frustration, it is essential to load your KBFIX program first. This won't solve all of the user input errors, but it will reduce them to the minimum acceptable aggravation level.

Tape Deta Files (RS) and Deta File Meneger (CC)

These programs are the heart of a data management system for a statistical analysis package. They allow data to be stored on tape for repetitive use and allow that data to be edited. The Radio Shack program can be used to create new data tiles, list data files (with a printer option), or update old data files by deleting or adding data alements for existing variables, or by adding a new variable and its data elements.

The Creative Computing package does this and more. This program allows the user to create a new file containing only some of the variables on the master file; to substitute (delete and add combined) values for the variables on the master file; to perform transformations of variables on the master

file; and to create a subfile containing some of the values of the variebles on the master file. A further word about the transformation option: the program ellows any variable to be transformed as follows:

New Variable = INT((Old Variable + AVD)

Here the values for A and D are user-supplied. The user's booklet tells you which program line to change to allow other trensformations. Nice touch.

Both packages require that different statistical programs use different data file formats. You cannot create a data file and run it with eny of the programs. Statistical packages for mainframe computers (of which SPSS—Statistical Package for the Social Sciences—is probably the best known) generally allow the user to use a common data file format for all of the stetistical analysis routines. This is helpful and I hope that the next generation of personal computer stetistical software writers will adopt the method.

Descriptive Statistics, Histogram, and Frequency Distribution from Radio Shack, as well as Descriptive Statistics from Creative, are programs for the statistical analysis of a single variable. It should be mentioned that Histogram (RS) is really a graphics program and not useful unless printed.

The two packages produce comparable information, except that the Creative Computing program has more features than the Radio Shack programs. It has two options that are used for test scoring. You enter either the number of questions right or the number of questions wrong, and the program scores each test, producing a statistical analysis of the scores.

Both packages produce similar descriptive statistics. The Creative Computing program includes the median, quartile values, and the standard error of the mean. The latter can be calculated using output of the Radio Shack program, but the first two values cannot.

Descriptive Statistics from Creative can correct erroneous data entries before running the program, but I had problems with this option. When I deleted data, even though it did not show up in the revised data listing, it was still part of the statistical computations.

T-test for Matched Pairs, and Correlation and Linear Regression from Redio Shack perform much the same job as Two Variable Statistics from Creative. Both packages perform standard two-variable statistical analysis. There are two major differences between them, however. The Creative Computing program conducts only a two-tailed t-test on the data, while the Radio Shack programs allow either one- or two-tailed

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won't solve all...errors, but it will reduce
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t-test. Also, the Radio Shack programs graphically display the two-variable regression and the original data points on the screen (or the printer).

The Radio Shack program, however, does not calculate the standard error of the estimate for the regression. The Creative Computing program does. Since both packages allow forecasting of the dependent variable, Radio Shack's omission is puzzling.

Chi-Square Analysis from Radio Shack and Crosstabulation from Creative are basically similar. The first major difference is the dimensions of the chi-square table. The Radio Shack program accepts up to an 8×8 matrix; the Creative Computing program accepts up to a 19×19 matrix. Other differences:

 The Redio Shack program allows the user to specify the expected cell frequences.

The Creative Computing program allows the chi-square matrix to be consolidated into a 2 x 2 contingency table, a useful feature if some frequencies are low or missing. The Creative Computing program allows the data to be entered raw. Each observation is entered as row and column numbers and the program then calculates the observed frequencies. You would be better off (in terms of finger fatigue) to calculate the frequencies before using the program.

•The Creative Computing program computes a gamma statistic in addition to the chi-square.

Regression-trend Analysis from Creative is easy to use as the time variable is abstract (period 1, 2, 3, etc.) and is automatically incremented with each data entry for the dependent variable. It also estimates the regression coefficients for eight functional forms, (including the linear model). Unfortunately, no information is provided so that the user can determine which functional form is best fit to the data (aside from the standard error of the estimate). Neither the regression routine in Creative's Two-Variable Statistics nor their Regression-trend Analysis calculates a correlation coefficient.

Multiple Linear Regression and Advanced Multiple Regression in the Creative Computing peckege seem to be e "bandald." Multiple Linear Regression is compatible with the Data File Manager while the Advanced Multiple Regression program is not. The latter only accepts data from tape in the form of DATA statements appended to it. The new program can be recorded on tape for later use. This is not a flexible system. The Multiple Linear Regression

program, like the rest of the programs in the package, was written by Richard Galbraith, while Advanced Multiple Regression was written by David J. Simecek.

Why a different author?

So what is wrong with the multiple regression program written by Galbraith?

First: The output consists of partial correfation coefficients between variable pairs, the means and standard deviations of the variables, and two sets of the regression coefficients. One set is the regular equation with no intercept, or constant, term. And that is it! Now! don't know of anyone who would estimate a regression equation and force the constant term to be zero.

The second problem with the Galbraith program is that it is unreliable. In testing all three programs, I used Multiple Regression Analysis—Simplified, an article by Dr. David M. Chereb in the February, 1979, issue of Creative Computing, as a benchmark. When I used the data with Creative's Multiple Linear Regression program, it ran through the correlation matrix and then produced the message:

THERE IS NO UNIQUE SOLUTION

I suspect that the matrix inversion algorithm produced a singular matrix. This is flatly unacceptable since the data does produce a solution in other programs.

The Advanced Mulitple Regression output consists of the regression coefficients, calculated t-values, a calculated F statistic, confidence intervals for the regression coefficients based on user-supplied t-values, and analysis of variance table, and the coefficient of determination (R²)—mislabeled as the "coefficient of multiple determination."

The program contains a data review and correction option, but after displeying the values of the dependent variable, the screen prompt reads: CORRECT AS FOR Y VALUES?. A response of YES gets a REDO message. The correct response is 0,0 as with the independent variable correction routine.

Another irritant is the prompt TYPE 1 FOR ANOTHER SET?. What do you type if you don't want another set of estimates? Answer: any other number; but that's not obvious. With some experimentation you can clear the problems up. That such "minor" problems exist, however, is evidence that the program has not received extensive user testing.

One major problem surfaced when I used the data from Dr. Chereb's article. The pro-

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ficients, but then went on to generate an erroneous analysis of variance table and other summary statistics. For example, the calcutated F statistic was reported as - 32.41 (it is actually 1594.62), the R2 was reported as 1.33 (it is actually 0.995), and the t-values were also incorrect. While Radio Shack's Multiple Linear Re-

gram produced the correct regression coef-

gression program performs well (it never missed a beat with any data I fed it-including Dr. Chereb's infamous set), and while it produces an acceptable set of summary statistics, it doesn't have some of the features that one might like. For example, it only handles up to five independent variables.

Also lacking in the program's summary statistics are tivalues or standard errors for the regression coefficients, a standard error of the equation, and an R2 adjusted for degrees of freedom. None of these are difficult to include, and they are indispensable for hypothesis testing.

While the Radio Shack and Creative Computing packages contain programs for Analysis of Variance, Radio Shack's program is considerably more limited, to a oneway analysis from two to five groups or samples. Radio Shack elso includes an addendum page, explaining which two lines of the program are to be changed. The error is non-fatal as it occurs in the program segment that controls the printing of the test statistics to the screen or the printer. The addendum is a nice touch, however, and shows some concern for testing of the programs.

Two-Way Analysis

The Creative Computing program will run one and two-way analyses of variance, up to 10 or 11 groups, one-way, (up to 100 or 121 groups' two-ways).

Creative's one-way ANOVA performs faultlessly and its output is perhaps better because the program generates sample means and standard deviations for each group and the sample as a whole. The twoway ANOVA is another story. After it generates the mean and standard deviations, the error message: /0 ERROR IN 2830 appears. Line 2830 reads:

2830 Y = 2/(9 8); X = 2/(9 A)

Somehow, somewhere, A or B are either being set to zero or have not been set after initialization, causing the program to bomb. As with both of the multiple regression programs, you could (it you have access to a printer) get a printout of the program and attempt to debug it.

This, of course, is the point. The programs are sold (and advertised) as complete, ready-to-run software. They are not.



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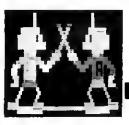
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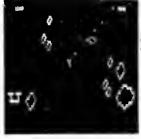
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manager, a designer, two or three sales people, and be considering hiring others, and yet its office is already understatfed and overworked.

Often the office is still a one person show. That one individual opens the mail, processes orders, types correspondence and invoices, answers the phone, receives customers, figures the payroll and taxes, does the bookkeeping, sends out statements, checks on overdue supplies, makes up the bank deposits, keeps the company checkbook up-to-date and more. As a business grows, these responsibilities can easi-

ly overpower even the most productive individual. It the company's ability to process information is not improved, inquiries may go unenswered, bookkeeping may fall behind, orders may not be shipped when promised and inventory may not be properly maintained.

Early on FSI management recognized that a well-organized and productive office is essential to its success and continued growth. On the left of the secretary's dask at FSI is a typewriter—on the right is a 48K TRS-80 with a tractor feed line printer and dual disk drives.

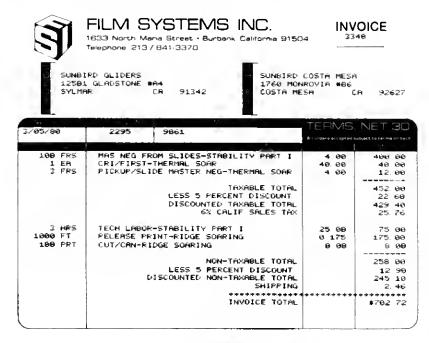


Fig. 1. Invoice Generated on TRS-80.





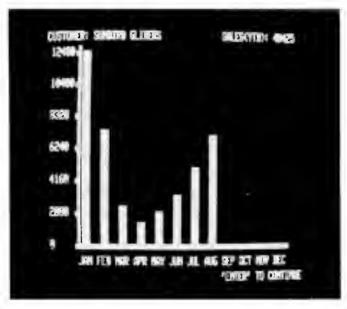


Photo 2. Bar Graph Displaying Sales by month.

Unfortunately the word "computer" still brings to mind an omnipotent machine of unmanageable size and tempermental nature, consuming punched cards and spewing forth great volumes of paper or magnetic tape. It would be more accurate to think of a microcomputer as a wrench or hand drill! The computer is a tool. It is simply a machine that can process, store and retrieve information quickly and repetitively.

Invoices

The first FSI bottleneck was invoice writing. The office was spending hours and hours writing invoices. Three factors contribute to this manual inefficiency:

- Much of the information used in processing invoices day-to-day is repetitive.
- Lists must be searched for service or parts names and prices.

 Extensions, totals, discounts and taxes must be calculated.

A microcomputer is well suited to these tasks. Customer names, billing addresses, shipping addresses, service and product titles, part numbers and prices and other information can be stored on disk files. This information can be accessed and typed very quickly. For example, consider the operator input necessary to write the invoice shown in Fig. 1.

Responding to prompts, the operator enters the data, customer number, ship-to option, customer reference number and job number:

DATE?: 3/05/80 (entered only at beginning of session)
CUSTOMER NUMBER?: 44
SHIP-TO OPTION?, 2
FSI JOB NUMBER?: 2295

CUSTOMER REFERENCE?: 9861

After printing the invoice headings the next prompt is:

TITLE?: STABILITY-PART I SERVICE CODE?: 1 QUANTITY?: 100 (optional film title)

Referring to a menu of services on the video display the operator enters a code and the quantity to be invoiced. The invoice writer does in minutes what used to take hours.

Another log jam in the FSI information flow was order processing. A large percentage of FSI orders are for filmstrips. The filmstrip is made from a previously processed master negative. These negatives are cataloged by title and are assigned a production



Photo 3. Display Monitoring Level of Activity of Key Invoice Items.



Photo 4.

number as well as other data used in making the filmstrip.

In pre-computer days when an order was received, the titles specified would be looked up in the negative catalog for the appropriate production numbers, a release order listing the quantity, production number and title. This and other pertinent information would be typed in duplicate end a "shipper" in triplicate. After the order was shipped an invoice would be typed in triplicate.

Most of the Information contained in the order, shipper, and invoice is the same; why type if three times? Now the negative catalog is atored on disk and up to 3000 titles can be searched by a machine language program in well under a second. With only a minimum of input from the secretary, the release orders and shippers are typed on the line printer.

A disk file of current orders is maintained and by specifying either the customer's purchase order number or the in-house job number an order can be displayed on the CRT (Photo 1). A hard copy option will print the order if desired. After the current order file has been updated with shipping information, the invoice writer previously described uses the same information in the file to write an invoice. The secretary need only specify the order number.

More Uaaful Resulta

After the major bottlenecks have been eliminated you are likely to discover that your data files and programs bear much fruit. After the initial planting, cultivation and growth, a great deaf of information may be harvested with little additional effort.

Relatively simple modifications to existing software may generate useful results. With a simple addition to the invoice writer, cumulative monthly sales totals may be added to the customer information file. In turn this information can generate a bar graph that displays sales by month for any specified customer (Photo 2).

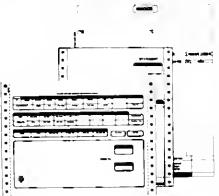
Another straightforward addition allows you to monitor the activity of certain key invoice items for a specified customer or for all customers (Photo 3). In many businesses the function of an order/invoice writer can be extended to support accounts receivable and sales journal processing.

With the addition of a purchases journel, the system can audit inventory depletion, prompt purchases when order points are surpassed, and also process accounts payable data.

The typewriter and the adding machine have for decades been the principal information processing tools of the small business. As certain as the calculator has replaced the slide rule, these traditional business machines have become outdated. I imagine there are a few stubborn individuals who will insist on using a slide rule instead of a calculator. No doubt similar individuals will continue to plug away on adding machines and standard typewriters, but for the great majority of us the course is clear. Make way for the office microcomputer!



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Velerie Venn 631 G Street Davis, CA 95616

As the hollday season approached last yeer, I thought it would be great to have something my computer could do to show off to visitors. "Battleship," "Tank Wers," and "X-Wing Fighter Bombing Runs" didn't seem appropriate. A computer Christmas card was more like what I had in mind.

These programs will run on a 16K Level II Model I, TRS-80. An alternate version of one subroutine Is included for Microsoft's Level III BASIC.

A Series

The program Hollday Graphics & Seasons Greetings, (Program Listing 1), is a series of five subroutines: Snowflakes, Seasons Greetings, Poem (a Level II BASIC adaptation and enhancement of a routine from David Lien's Level I Manual), Snow Scene, and a Signature Page (for personalizing your computer greeting card). The program is designed to repeat endlessly and one complete cycle takes an average of 26 minutes.

If you're getting the family an 80 for Christmas, you could even sit it under the tree and let it run this program.

The program is numbered in modules of 1,000. Each begins with a REM statement identifying the subroutine number.

Each routine can be run alone or with one

or two others by making minor changes. The first lines of the program identify initialization statements for the subroutines. The ending lines contain the RESTORE statement to run the Season's Greeting and Snow Scene routines in an endless cycle. The GOTO statement returns the program to the Snowflake routine for another complete cycle.

If you want to run the Poem routine by itself, a FOR-NEXT time delay loop should be added to the end. This is because the time used in setting up the following Snow Scene graphics array serves as a time delay in the combined program.

The displeys are best viewed from a distance of at least eight faet in a dimly lit room. The brightness and contrast of the CRT should be adjusted to give a crisp black and white effect. Then sit back with your cup of eggnog and watch it snow!

The Snowflake subroutines contrast the BASIC language graphics routines with the speed and simplicity of the vector graphics enhancements in Microsoft's Level III BASIC. This uses the line plotting statement LINE(X1,Y1) – (X2,Y2),SET.

The Level II version substitutes a fine plotting subroutine for this Level III statement, and thus runs slower. Both versions are compatibly line numbered so the differences can be identified readily.

Six-Sided Designs

The Snowflakes programs (see one in Program Listing 2) draw six-sided designs on the video display screen. They use the smallest TRS-80 graphics block, or pixel. Like real snowflakes, the odds against getting two alike are astronomical!

Each flake is drawn in 5 to 12 cycles of

line plotting (the number of cycles is selected at random). In each cycle, the X and Y coordinates for two points are generated at random. The line defined by the two points is then plotted, and rotated in 60 degree increments and plotted in six positions. The mirror image of this rotating line is then computed and plotted.

The designs are not always symmetrical because coordinates are rounded to the nearest integer value. You will also notice a pixel of variation in some line positions.

The results are usually attractive, especially considering the limits of the TRS-80 graphics system: You are plotting hexagonal figures with rectangular blocks.

Line 270 contains an adjustment factor for the aspect ratio of the screen (constant V). This produces a round visible plot on my screen. You may wish to adjust it slightly to get the best results on your CRT. Use something in the neighborhood of 128/48.

Other kaleidoscopic effects can be produced by changing the angle of rotation (lines 550-560, P/3) and the number of plotting positions (line 540, FOR J=1 TO 6). Change these to P/(n/2) and FOR J=1 TO n, where n is the number of sides you want the figure to have. Also, the aspect ratio constant V can be changed or eliminated.

Trigonometry and analytic geometry teachers and their students might have tun taking the program apart. It contains all those basic elements like polar coordinates; translation and rotation of axes; slopes and intercepts.

Anyway, It's fun to watch. The snow-flekes even have a crystalline appearance, thanks to the little rectangular blocks. They seem to grow like frost patterns on a window.



Program Listing.

```
10 REM INITIALIZE GRAPHICS ROUTINES
20 RANDOM: REM ROUTINES 2,4,5
30 CLEAR 1000: REM ROUTINE 5
40 DIM A$(16):OIM S(21,2): REM ROUTINE 5
50 CLS:PRIMT HOLIDAY GREETINGS WITH SNOW 60 PRINT:PRINT GRAPHICS BY VALERIE VANN
70 PRINT CHR$(204)+"631 G ST., DAVIS, CA."
00 PRINT CHR$(204)+"COPYRIGHT 1900"
90 PRINT"POEM SUBROUTINE ADAPTED FROM A LEVEL I BASIC P
      ROGRAM"
100 PRINT"BY DAVIO LIEN.
110 FOR X=1 TO 1000:NEXT X
1000 REM ENTER SIGNATURE - ROUTINE 1
1010 PRINT0512, "IF YOU WISH TO SIGN THIS GREETING, TYPE
YOUR NAME, ": PRINT0576, "THEN PRESS ENTER. IF NOT,
       JUST PRESS ENTER.
1020 PRINT" (MAXIMUM OF 20 CHARACTERS) ": PRINT"
      $ (20, "-")
1030 INPUT B$:IF LEN(B$)>20 THEN 1020
1040 IF BS=""THEN BS="YOUR FRIENDLY COMPUTER - ME!"
2000 REM TITLE PAGE SNOWFLAKES - ROUTINE 2
2010 CLS
2020 PRINT CHR$(23)
2030 FOR J=2 TO 442 STEP 0
2040 PRINTEJ, "*"
2050 FOR F=1 TO 10:NEXT F
2060 NEXT J
2070 PRINT0452,"* * S N O W F L A K E S * **
2080 FOR J=514 TO 950 STEP 0
2090 PRINT0J, ***
 2100 FOR F=1 TO 10:NEXT F
2110 NEXT J
2120 FOR J=1 TO 950:NEXT J
 2130 V=120/40
 2140 P=3.141592654
 2150 FOR E=1 TO 5
 2160 CLS
 2170 FOR K=1 TO (RND(5)+7)
 2109 X=RND(24)
2190 Y=RNO(24)
2200 R=SQR(X[2+Y[2)
 2210 IF R>24 THEN 2180
 2220 T=RND(24)
 2230 Z=RND(24)
 2240 S=SQR(T[2+Z[2)
 2250 IF S>24 THEN 2220
 2260 GOSUB 2340
 2270 Y=-1*Y
 2200 Z=-1*Z
 2290 GOSUB 2340
 2300 NEXT K
 2310 FOR I=1 TO 2000: NEXT I
```

Program continues

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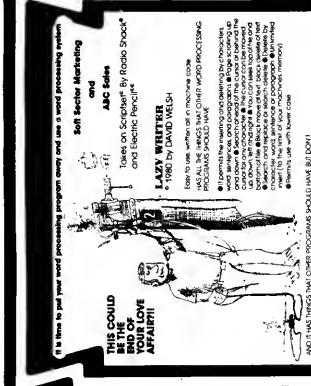
- 44

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DRESS	
Υ	
TE	ZIPCODE

```
2320 NEXT E
2330 GOTO 3000
2340 W=ATN(Y/X)
2350 Q=ATN(Z/T)
2360 FOR J=1 TO 6
2370 W=W+P/3
2380 Q=Q+P/3
2390 X2=R*COS(W)
2400 Y2=R*SIN(W)
2410 T2=S*COS(Q)
2420 Z2=S*SIN(Q)
2438 X3=(X2*V+64):Y3=(Y2+24):T3=(T2*V+64):Z3=(Z2+24):GO
     SUA 2460
2440 NEXT J
2450 RETURN
2460 IF X3=T3 THEN 2620
2470 IF x3>T3 THEN N=(Y3-Z3)/(X3-T3) ELSE M=(Z3-Y3)/(T3
     -x3)
2400 B=Y3-M*X3
2490 IF ABS(23-Y3) >ABS(T3-X3) THEN 2560
2500 IF X3>T3 THEN D=-1 ELSE D=1
2510 FOR H=X3 TO T3 STEP D
2520 Y3=M*H+a
2530 SET(R,Y3)
2540 NEXT H
2550 RETURN
2560 IF Y3>Z3 THEN D=-1 ELSE O=1
2570 FOR H=Y3 TO Z3 STEP D
2500 X3=(H-B)/M
2590 SET(X3,H)
2600 NEXT H
2610 RETURN
2620 IF Y3>Z3 THEN 0=-1 ELSE D=1
2630 FOR H=Y3 TO Z3 STEP O
2640 SET(X3, H)
2650 NEXT N
2660 RETURN
3000 REM SEASONS GREETINGS - ROUTINE 3
3010 CLS
3020 READ X.Y
3030 IFX=0 AND Y=0 THEN 3010
3040 PRINT@ X, CHR$(Y):GOTO 3020
3050 DATA 13,160,14,176,15,176,16,176,17,176,10,176
3060 OATA 72,160,73,104,74,156,75,143,76,131,77,131,70,
     131
3070 OATA 79,131,00,131,81,131,02,131,03,143,04,188
3000 DATA 136,139,137,143,130,109,139,176,140,144,147,1
3090 DATA 140,176,149,176,150,176,154,176,155,176,156,1
3100 DATA 157,176,150,176,159,144,161,176,162,176,163,1
3110 DATA 160,176,169,176,170,176,171,176,175,176,177,1
3120 DATA 170,176,179,176,103,176,104,176,105,176,106,1
3130 DATA 107,144,196,176,197,152,190,140,199,100,200,1
3140 DATA 203,130,204,131,205,139,206,173,207,100,200,1
3150 DATA 209,160,210,191,211,141,212,140,213,140,214,1
3160 DATA 215,129,216,184,217,159,218,129,220,160,221,1
3178 DATA 222,143,224,139,225,173,226,176,227,146,228,1
3180 DATA 230,180,231,151,232,129,235,186,236,149,238,1
3190 DATA 239,159,240,131,242,184,243,159,244,129,246,1
3200 DATA 247,173,248,176,249,144,250,130,251,131,252,1
3210 DATA 250,160,259,103,260,144,269,160,270,104,271,1
3220 DATA 272,133,273,130,274,143,275,140,276,140,277,1
3230 DATA 270,129,279,130,200,139,201,140,202,140,203,1
3240 DATA 204,143,285,133,287,131,288,140,289,148,298,1
3250 DATA 291,135,294,139,295,141,296,140,297,140,298,1
      35
                                              Program continues
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Victor Andrews and Soft Sector Marketing, Inc.



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SUPER-UTILITY DV K WATT

SUPER-UTILITY was winthen by Kim Watt of Bleeze Computing and is the most fantastic program of its kind to be available on the invarient of this firme SUPER-UTILITY is a most-on-the brogulage stand obtain protost in shown VOI to this stand does not use on VOIAM most in shown VOI to this stand does not use on wROM of the SUPER-UTILITY is a most of season; it is hould display advantation? CPM, most in shown and the last be in any drive ofter innollation of the program. This program display supports the Radio Stock was case in mark and other innollation. SUPER-UTILITY occupies all memory from 4000H to 9FFH. (That's SAIK of most hine codes!)

The zoputitivis approgramment does everything Approals' SuperZop" does, plus manny additional enhancements the zoputitivis approgramments and the disconded and additivity and the user to go the head of the fields and find of another and the size as whether the profeed disk and if the user to go the head of the disconder and size as an experiment of the size as experimental disk of the sector in LEX and ASC) to that disk of a contribution that the colors and any profession of the size and associate the size and whether sector is BMM tomat and a contribution that a contribution that are and elegated and whether sector is BMM tomat and according to bowest the profession of the size and associated and associated as and associated as a contribution of the profession and even allows user to single step that to facility of the profession and associated as a contribution of the profession and associated as a contribution of the profession and associated as a contribution of the profession and associated as a section of associated as a section and associated as a section and memory in addition you may search in memory at the disk for a specified string and have its location refurred.

Purge is a utility that allows user tarkilities by filespec or have the comouter list them one at a time for deletion in addition. Lough will allow be set on the used disk level of four or box or about the posswords on files in addition, you can full lists by naming the category of the lites (example /CMA)/BAS/TXI. In wisebe, (N) visible, etc.) and also may change the disk name, date, passwords, patient in evels Purge also continue, accompletely disk directory that and category disk name, date, passwords, protection levels Purge also continue, accompletely disk directory that and category dia change and increased in the status of all grounds on the disk.

Formal is a utitify that allows the user to format a disk with standard format format WIHOUT BASING existing data as special format (custom format your disk any way you want if). This utility also allows the user to add tracks to any disk (example, change a 35 track disk to a 40).

The data copy utility will copy any standard data with as without formatting. The special disk copy allows the user to make a bockup of "Ayy" (That Standard) (TSE-80) readoble disk that spessingly with the anset inegradies at any efforts that have been made to protect the data from being backed up NOTE (the only exception is that it won't copy itself). This programs sonly infended use is for user to make backups of half her legally purchased programs for higher own use. Please do not use this utility to make "bootleg copies" for others as outhors of quality programs. Geseive 10 se pool for their orygines.

The laps capy utility allows the user to make backups of "ANY" TRS-80" readable tapes currently on the morket egacitiess of any protection attempts or bould rate.

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```
3260 DATA 299,129,300,136,301,142,302,131,304,136,305,1
     90,306,179,313,107,314,159
     DATA 323,130,324,131,325,143,326,140,327,108,320,
    100
3200 DATA329,100,330,100,331,100,332,143,333,135,334,13
     1,341,176,342,176,343,152,344,140
3290 DATA 345,140,346,140,347,140,340,140,349,140,350,1
3300 DATA 351,140,352,140,353,140,354,140,355,140,356,1
3310 DATA 357,140,350,140,359,140,360,140,361,140,362,1
3320 DATA 363,140,364,140,365,140,366,140,367,140,360,1
3330 DATA 369,140,370,140,371,140,372,140,373,140,374,1
     40,375,140,376,135,377,131,306,160
3340 DATA 404,175,405,176,406,144,423,160
3350 DATA 424,104,425,132,429,160,433,160,434,176,435,1
3360 DATA 436,140,437,129,451,131,452,172,453,100,454,1
     00
3370 DATA 455,140,456,143,457,131,450,131,459,131,460,1
3300 DATA 461,191,470,131,471,131,472,141,473,140,474,1
3390 DATA 475,140,476,140,477,140,470,140,479,140,480,1
3400 DATA 401,140,402,140,403,140,484,140,405,140,406,1
3410 DATA 487,159,400,141,409,140,490,132,491,136,492,1
     43
3420 DATA 493,129,494,140,495,140,496,131,497,131,514,1
     76
3430 DATA 515,190,516,143,517,129,519,131,520,131,521,1
3440 DATA 522,131,523,131,524,131,527,187,528,157,529,1
3450 DATA 530,131,531,139,532,132,533,160,534,100,535,1
3460 DATA 536,179,537,107,530,132,540,160,541,100,542,1
3470 DATA 543,179,544,179,545,157,548,160,549,198,550,1
3400 DATA 553,160,554,190,555,135,557,104,550,159,559,1
     34,560,131
    DATA 561,131,561,171,562,109,564,160,565,100,566,1
     35
3500 DATA 567,163,560,191,569,151,570,160,571,103,572,1
3510 DATA 573,131,574,139,575,132,577,191,578,191,502,1
     76
3520 DATA 503,140,584,134,585,131,506,131,507,131,500,1
     88
3530 DATA 509,160,590,191,591,135,597,175,598,101,599,1
     76
3540 DATA 600,104,601,140,604,175,605,181,606,176,607,1
     84,608,148
3550 DATA 611,184,612,159,613,129,616,104,617,159,618,1
     29,619,176,620,190,621,135,623,160,624,104
3560 DATA 625,143,626,129,627,136,620,191,629,177
3570 DATA 630,172,631,191,632,135,636,130,637,191,638,1
3500 DATA 641,191,642,191,646,130,647,131,648,140,649,1
3590 DATA 650,140,651,190,652,159,653,140,654,140,655,1
3600 DATA 656,140,657,140,658,180,659,144,668,168,669,1
3610 DATA 675.139,676.141.677,140,678,140,608,131,609,1
3620 DATA 693,104,694,159,695,129,699,176,700,150,701,1
3630 DATA 705,130,706,139,707,173,700,100,709,176,710,1
     76
3640 DATA 711,176,712,176,713,184,714,150,715,135,716,1
     29
3650 DATA 720,172,721,144,723,162,724,107,725,100,726,1
     76,727,176
3660 DATA 720,176,729,176,730,176,731,176,732,176,733,1
```

Program continues

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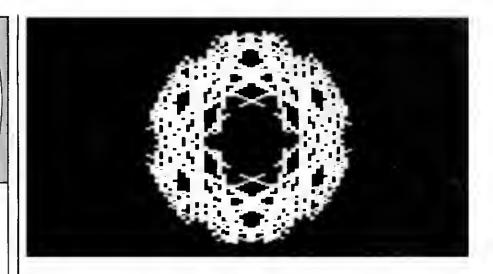
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3670 DATA 734,105,735,180,736,176,737,176,738,176,739,1
3680 DATA 740,176,741,176,742,176,743,176,744,176,745,1
3690 DATA 746,176,747,176,740,176,749,176,750,176,751,1
     76
3700 DATA 752,176,753,176,754,176,755,176,756,190,757,1
3710 DATA 750,176,759,140,760,140,761,134,762,131,780,1
3720 DATA 781,140,702,140,783,134,784,131,785,139,786,1
3730 DATA 787,177,788,176,789,143,796,160,797,152,800,1
3740 DATA 801,137,902,140,903,140,904,164,805,176,806,1
3750 DATA 807,176,808,176,809,176,810,176,811,176,812,1
3760 DATA 913,176,914,176,815,152,816,140,817,140,819,1
3770 DATA 819,129,842,136,843,191,844,145,856,176,857,1
3780 DATA 850,184,859,142,860,131,900,130,909,131,910,1
3790 DATA 911,140,912,140,913,140,914,140,915,140,916,1
     40
3800 DATA 917,140,910,131,919,131,0,0
3810 FOR X=1 TO 3200:NEXTX
4000 REM POEM SEQUENCE - ROUTINE 4
4010 CLS:PRINTCHR$(23):PRINT"STOPPING BY WOODS"
                ON A SNOWY EVENING": PRINT
4020 PRINT"
4030 PRINT"
                      BY ROBERT FROST
4040 FOR X=1TO2000:NEXTX:CLS
4050 FORZ=1TO150
4060 SET(RND(127), RND(47)):FORR=1TO30:NEXTR:NEXTZ
4070 PRINT@460,CHR$(230);:GOSUB4440 :PRINT@525,CHR$(230
     );:I=0:GOSUB4440
4080 PRINT@525, " WHOSE WOODS THESE ARE I THINK I KNOW."
4090 GOSUB4440
4100 PRINT@525, " HIS HOUSE IS IN THE VILLAGE, THOUGH; "
4118 GOSUB4448
4120 PRINT@525, " HE WILL NOT SEE ME STOPPING HERE
4130 GOSUB4440
4148 PRINT@525," TO WATCH HIS WOODS FILL UP WITH SNOW
4150 GOSUB4440
4160 PRINT@525," MY LITTLE HORSE MUST THINK IT QUEER
4170 GOSUB4440
4180 PRINT@525, " TO STOP WITHOUT A FARMHOUSE NEAR
4190 GOSUB4440
4200 PRINT0525, BETWEEN THE WOODS AND FROZEN LAKE
                                                       ۳;
4210 GOSUB4440
```

Program continues



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refers to recording density in bits per inch (bpi). Typically bingle density means data can be recarded up to 2,938 bpi; dauble density means data can be recarded up to 5,876 bpi. PROUBLE. SIDED

refers to number of read/write heads. Single-sided is one head, read/write one side anly; double-sided is dual heads ollowing read/write opera-tions on both sides of the diskette. A double sided drive appears as two separate drives to the controller.

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unformated capacity is the total amount of starage space total amount at starge space available on a diskette. Typically 125K bytes on a 40 track 5.25in. diskette. Formated capacity is the total USABLE starage space on a diskette. Typically 102K bytes on a 40 track 5.25in. diskette. the time required for the head to move from one track to the next. Typically 5 to 40

ACCESS

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density unformated 250K bytes; dauble density unformated 500K bytes).

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PERCOM	YES	25ms	YES	NO	250K bytes (both sides)	YEŞ	NO
MPI	NO	5ms	YES	YES	125K bytes	YES	NO
SHUGART	NO	40ms	YES	NO	109K byles	NO	NO
SIEMENS	NO	25ms.	YES	NO	I2SK bytes	YES	NO
TANDON	NO	Sms.	NO	NO	125K bytes	NO	NO
PERTEC	YEŞ	25ms	YES	NO	250K bytes (both sides)	Ю	NO
BASF	NO	12ms	YES	NO	125K bytes	NO	NO

Factual material from current manufacturer's data sheets is believed reliable but cannot be guaranteed, comparing Aerocamp Model 40.1 to similar models

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4220 PRINT@525," THE DARKEST EVENING OF THE YEAR
4230 GOSUB4440
4240 PRINT@525, " HE GIVES HIS HARNESS BELLS A SHAKE
4250 GOSUB4440
4260 PRINT@525," TO ASK IF THERE IS SOME MISTAKE.
4270 GOSUB4440
4200 PRINT@525," THE ONLY OTHER SOUND'S THE SWEEP
4290 GOSUB4440
4300 PRINT@525, " OF EASY WIND AND DOWNY FLAKE.
4310 GOSUB4440
4320 PRINT@525," THE WOODS ARE LOVELY, DARK, AND OEEP,"
4330 GOSUB4440
4340 PRINT@589," BUT I HAVE PROMISES TO KEEP,
4350 I=3:GOSUB4440
4360 PRINT0653, AND MILES TO GO BEFORE I SLEEP,
                                                    ٠;
4370 I=6:GOSUB4440
4300 PRINT@717,
                AND MILES TO GO BEFORE I SLEEP.
4390 I=9:GOSUB4440
4400 FOR A=1T0800
4410 SET(RND(127),RND(47)):NEXTA
4420 CLS: PRINTCHR$(23): PRINT@76, **";: PRINT@170, "*";: PRI
     NT@322, "BUT I HAVE PROMISES TO KEEP, ":: PRINT@512,
ANO MILES TO GO BEFORE I SLEEP..";
4430 PRINT@644,"*";:PRINT@690,"*";:PRINT@850,"*";:GOTOS
4440 FORN=1TO20
4450 X=RND(127):Y=RND(47)
4460 IF Y=24+I GOTO4450
4470 IF Y=25+1 GOTO4450
4480 IF Y=26+I GOTO4450
4490 SET(X,Y)
4500 FORA=1TO40:NEXTA
4510 NEXTN
4520 RETURN
5000 REM SNOW SCENE - ROUTINE 5
5010 FORL=1TO16
5020 A$(L)="":REAO N
5030 FOR Z=1TON
5040 REACY: A$ (L) = A$ (L) + CHR$ (Y)
5050 NEXTZ:NEXTL
5060 PRINT CHR$(20)
5070 FORL=1T016
5088 PRINTA$ (L);
5098 NEXTI.
5100 FORY=45TO47:FORX=122TO127
5110 SET(X,Y):NEXTX:NEXTY
5120 FORN=1TO2000: NEXTN
5130 FORN=1TO21
5140 READP,Q:S(N,0)=P:S(N,1)=Q:NEXTN
5150 FORR=1T010
5160 FORN=1TO21
5170 P=S(N,0):Q=S(N,1):RESET(P,Q):NEXTN
5180 FORT=1TO21
5190 P=S(T,0):Q=S(T,1):SET(P,Q):NEXTT
5200 NEXTR
5210 GOTO5780
5220 DATA 9,197,144,215,136,209,172,198,144,202
5230 DATA 19,200,160,184,180,191,191,191,191,189,188,17
     6,215
5240 OATA 129,195,160,186,189,176,207
1,149
5260 DATA 207,129,201,176,190,191,191,191,141,176,199,1
     30,197
5270 OATA 27,194,129,197,130,139,143,191,191,191,191,15
     9,143
5200 DATA 131,197,130,211,135,120,176,191,191,191,109,1
     00,100,144,203
5290 DATA 27,196,144,206,168,203,129,199,160,196,188,19
     1.191
5300 DATA 191,191,191,191,191,143,188,100,180,176,1
     44,194,160,194
5310 DATA 30,194,160,186,190,129,199,168,191,176,198,14
     4,197
5320 DATA 190,176,108,108,191,191,191,191,191,191,191,1
     91,189
5330 OATA 176,196,130,133,197
5340 DATA 43,120,160,184,190,183,179,202,176,108,191,19
     1,191
5350 DATA 191,188,176,200,106,176,195,168,143,131,131,1
     31,131
                                             Program continues
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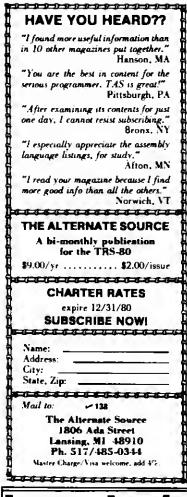
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91,108
5378 DATA 188.188.176.176.196
5380 DATA 58,128,129,184,191,191,191,191,188,176,195,17
    6,108
5390 DATA 143,131,175,191,191,191,191,108,176,178,131,1
    35,194
5400 DATA 160,148,172,191,191,191,189,176,144,128,176,1
    76,190
5410 DATA 191,135,191,191,143,191,191,191,191,191,191,1
    35,131
5420 DATA 131,143,131,131,129,138,196
5430 DATA 60,148,175,191,191,191,191,172,180,176,129,19
     4,130
5440 DATA 128,104,190,191,175,191,191,191,191,170,179,1
    79,139
5450 DATA 128,160,184,188,191,191,191,131,143,140,140,1
    42,179
5460 DATA 179,179,179,188,148,148,128,172,179,143,191,1
    91,191
5470 DATA 191,189,100,100,196,160,100,190,191
5408 DATA 64,134,107,191,191,191,191,109,100,170,139,13
     2.176
5498 DATA 188,183,179,180,108,191,191,191,191,191,191,1
     91.191
5500 DATA 189,191,189,188,191,143,179,188,128,143,143,1
     43,179
5518 DATA 179,179,188,188,188,191,191,148,143,143,143,1
     43,131,131,131,131,131,131,131,179
5520 DATA 179,188,191,191,143,191
1,191
91,143
5550 DATA 191,143,179,108,188,143,143,179,188,191,143,1
     43,131
5560 DATA 131,131,203,176,180,191,191,191,191,191,159,1
     43,179
5578 DATA 188,128,188
1,191
5590 DATA 191,191,143,191,191,143,143,143,179,179,179,1
     88,128
5600 DATA 188,191,143,179,188,191,143,131,207,176,190,1
     91,191
5610 DATA 191,143,131,143,179,188,198,191,143,179,128,1
5620 DATA 49,191,191,143,191,191,191,143,143,143,179,17
     9,179
5638 DATA 188,188,128,188,188,191,143,143,143,179,179,1
     79,128
5648 DATA 179,188,191,191,143,129,208,138,191,191,191,1
     91,191
5650 DATA 191,120,102,131,135,137,108,191,191,191,191
5668 DATA 45,179,179,128,188,188,188,191,191,143,143,14
     3,179
5670 DATA 179,179,128,180,188,180,191,191,191,191,191,1
     91,191
5600 DATA 191,143,135,129,212,131,191,191,191,108,176,1
     52.143
5690 DATA 175,191,140,132,129,162,191
5780 DATA 41,143,143,128,179,179,100,100,108,191,191,19
     1.191
5710 DATA 191,191,191,191,191,191,143,143,143,131,1
     31,216
5728 DATA 168,184,191,191,131,131,191,143,135,179,100,1
     02,139
5730 DATA 144,162,191
5748 DATA 32,191,191,188,159,143,143,143,143,143,131,13
     1,131
5758 DATA 131,131,129,221,176,176,188,188,191,191,191,1
     88,194
5768 DATA 152,143,143,167,179,188,191
5770 DATA 125,14,86,37,70,6,22,15,82,31,49,9,89,43,10,2
     ,72,35,64,12,42,46,108,2,6,9,63,40,81,14,50,45,56,
     17,119,6,92,33,04,3,59,1
5780 FDRA=1TO2000
 5790 X = (RND(128)) - 1 : Y = (RND(40)) - 1
5800 SET(X,Y)
5010 X=RND(127):Y=(RND(23))+24:SET(X,Y):NEXTA
 5829 FDR Y=47 TO 8 STEP -1
```

Program continues

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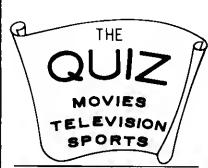
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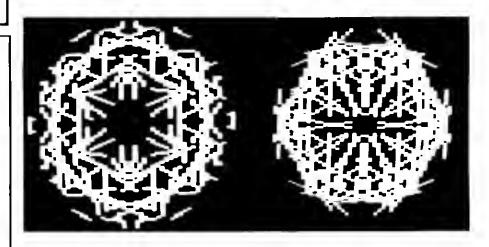
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5030 FOR X=0 TO 127 5040 SET (X,Y) 5050 T=RND(127):W=Y-2 5860 IFW<0 THEN 5900 5870 SET(T.W) 5800 T=RND(127):W=RND(47) 5090 SET(T,W) 5900 NEXTX:NEXTY 5910 FORX=1TO500:NEXTX 6000 REM SIGNATURE PAGE - ROUTINE 6 6010 CLS: P\$="*": PRINT CHR\$ (23) 6020 L=LEN(B\$):L=INT(L/2)*2 6030 S1\$=STRING\$(6,"*")+CHR\$(212)+STRING\$(6,"*") 6040 FOR J=0 TO 950 STEP 10 6050 PRINT@J,P\$:NEXT J 6060 FOR J=1 TO 75:NEXT J 6070 FOR K=0 TO 190 STEP 10:PRINT@X,P\$:NEXT K 6000 PRINT@192,51\$ 6090 PRINT@256,P\$ 6100 PRINT@200,"H A P P Y"
6110 PRINT@318,P\$:PRINT@320,P\$:PRINT@384,P 6120 PRINT@402, "H O L I D A Y S" 6130 PRINT@446, P\$: PRINT@448, P\$: PRINT@510, P\$: PRINT@512, P 6140 PRINT@540, "FROM" 6150 PRINT@574,P\$:PRINT@576,P\$:PRINT@638,P\$:PRINT@640,P 6160 PRINT@(672-L),B\$ 6170 PRINT@702,P\$ 6100 PRINT 0704, S1\$ 6190 FOR K=770 TO 950 STEP 10 6200 PRINT@K,P\$:NEXT K 6210 FOR J=1 TO 2500:NEXT J 7000 RESTORE: REM ROUTINES 3 & 5



7010 GOTO 2000 : REM REPEAT ROUTINES 2 THRU 5

Program Listing

10 RANDOM:CLS:PRINT:PRINT
20 PRINT"SNOWFLAKES"
30 PRINT"COPYRIGHT 1900 BY"
40 PRINT"VALERIE VANN"
50 PRINT"631 G ST., DAVIS, CA."
60 PRINT:PRINT"LEVEL II BASIC"
70 FOR J=1 TO 800:NEXT J
130 REM TITLE FAGE
140 CLS
150 PRINT CHR\$(23)
160 FOR J=2 TO 442 STEP 8
170 PRINT@J,"*"
180 FOR F=1TO10:NEXT F
190 NEXT J
200 PRINT@450,"* * S N O W F L A K E S * * **

Program continues

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```
210 FOR J=514 TO 958 STEP 0 220 PRINT@J, "*"
     FOR F=1 TO 10 :NEXT F
230
240 NEXT J
250 FOR J=1 TO 950:NEXT J
260 REM INITIATE & SET NO. OF REPEATS
270 V=120/40
200 P=3.141592654
290 FOR E=1 TO 5
300 CLS
310 REN OFFINE LINE & NO. OF LINES
320 FOR x=1 TO (RNO(5)+7)
      X=RNO(24)
330
340
      Y=RNO(24)
      R=SQR (X[2+Y[2]
350
360
      IF R>24 THEN 330
370
      T=RNO(24)
300
      Z=RND(24)
     S=SQR(T[2+2[2)
390
400
     IF S>24 THEN 370
410
     GOSUB 520
420 REM MIRROR IMAGE OF LINE
430
     Y=-1*Y
     2 = -1 * 2
448
450
     GOSUB 520
    REM DELAY LOOP IN LEVEL 3 VERSION
460
470 NEXT K
400 FOR I=1 TO 2000:NEXT I
490 NEXT E
500 GOTO 140
510 REM SUBROUTINE-PLOT & ROTATE
520 W=ATN(Y/X)
530 Q=ATN(Z/T)
540 FOR J=1 TO 6
550
      W=W+P/3
560
       Q=Q+P/3
570
       X2=R*COS(W)
       Y2=R*SIN(W)
580
590
       T2=5 * COS (Q)
       22=5*SIN(Q)
600
610 X3 = (X2*V+64) : Y3 = (Y2+24) : T3 = (T2*V+64) : Z3 = (Z2+24) : GOS
      UB 650
620 NEXT J
630 RETURN
640 REM LEVEL II LINE PLOT SUBROUTINE
650 IF X3=T3 THEN 010
660 IF X3>T3 THEN M=(Y3-Z3)/(X3-T3) ELSE M=(Z3-Y3)/(T3-
670 B=Y3-N*X3
600 IF ABS(Z3-Y3) >ABS(T3-X3) THEN GOTO 750 690 IF X3>T3 THEN 0=-1 ELSE D=1
700 FOR H=X3 TO T3 STEP D
710
       Y3=M*H+B
       SET (H,Y3)
720
730 NEXT B
740 RETURN
750 IF Y3>23 THEN D=-1 ELSE D=1
760 FOR R=Y3 TO 23 STEP 0
778
       X3 = (H-B)/M
788
       SET(X3,R)
790 NEXT H
800 RETURN
810 IF Y3>23 THEN 0=-1 ELSE 0=1
020 FOR B=Y3 TO 23 STEP D
       SET(X3, M)
838
840 NEXT H
850 RETURN
```

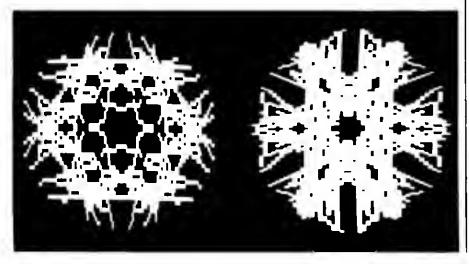
Program Listing

```
*** SNOWFLAKES ***

for TRS-80 Model I 16K

with MICROSOFT LEVEL III BASIC*
10 CLS:PRINT*THIS PROGRAM RUNS UNDER LEVEL III BASIC*
20 PRINT*(MICROSOFT CONSUMER PRODUCTS, BELLOUE, WA.)*
30 PRINT*IF YOU HAVE NOT LOADED LEVEL III.*
40 PRINT*DO SO NOW, AND THEN RE-LOAD THIS PROGRAM.*
```

```
50 PRINT"TO RUN THE PROGRAM, PRESS ENTER."
60 INPUT Q$
70 CLS:PRINT:PRINT
80 PRINT"SNOWFLAKES"
90 PRINT"COPYRIGHT 1980 BY"
100 PRINT"UALERIE VANN"
110 PRINT"631 G ST., DAUIS, CA."
120 FOR J=1 TO 800:NEXT J
130 REM TITLE PAGE
140 CLS
150 PRINT CHR#(23)
160 FOR J=2 TO 442 STEP 8
170 PRINT@J, "*"
180 FOR F=1T010:NEXT F
190 NEXT J
200 PRINT@450, "* * SNOWFLAKES * *"
210 FOR J=514 TO 958 STEP 0
220 PRINT@J, "*"
230 FOR F=1 TO 10 :NEXT F
240 NEXT J
250 FOR J=1 TO 950: NEXT J
260 REM INITIATE & SET NO. OF REPEATS
270 RANDOM: U=120/48
280 P=3.141592654
290 FOR E=1 TO 5
300 CLS
310 REM DEFINE LINE & NO. OF LINES
320 FOR K=1 TO (RNE(5)+7)
330
     X=RND(24)
340
      Y=RND(24)
350
     R = SOR(X[2+Y[2)]
      IF R>24 THEN 330
360
370
      T=RND(24)
380
     Z=RND(24)
    S=SQF(T[2+Z[2)
390
     IF 5>24 THEN 370
400
    G0$U8 520
410
420 REM MIRROR IMAGE OF LINE
430 Y=-1*Y
440
    Z=-1*2
450
    GOSUB 520
460 FOR L=1 TO 80:NEXT L
470 NEXT K
480 FOR I=1 TO 2000: NEXT I
490 NEXT E
500 GOTO 140
510 REM SUBROUTINE-PLOT & ROTATE
520 W=ATN(Y/X)
530 Q≃ATN(Z/T)
540 FOR J=1 TO 6
550
     W=W+P/3
560
     0=0+P/3
     X2≃R*00S(⊌)
570
      Y2=R*SIN(W)
580
      T2=S*C0S(Q)
590
      Z2=$*$IN(Q)
600
610
      LINE(X2*U+64,Y2+24)-(T2*U+64,Z2+24),SET
620 NEXT J
630 RETURN
```



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CAL81

John F. Strazzarino 150 Dundee Drive South San Francisco, CA 94080 THE STATE OF THE S

Editor's Note: Here is a complete program for a 1981 calendar called CAL81. It includes a personalized option as well as a picture option. The first one lets you select from five pictured calendar heads: Mickey Mouse, butterfly, seal with a ball on its nose, eirplane or penguin.

The second option lets you put in a personalized phrase at the bottom. The program has five phrases from which you can choose—or allows you to write your own.

When the author shows off his TRS-80 to friends, he likes to hand out a calendar with a personal message.

So, here is a program listing with samples of calendar graphics to go with the months. Marry Christmas!

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1030 1130 1220 1320 1330 1340 1450 1460 1510 2690
      1350 2650
      1330 1360
      1370
      1130 1380
      1320 1390
  32
      1530
  78
      1400
      1140 2650
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      1500
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      1220
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      1460 1500
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      2680
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      2380 2440 2510 2590
      1200/$ 1210/$ 1220/$ 2670/$ 2680/$ 2690/$
      1330/$2 1340/$ 1360/$
       1010/$ 1020/$ 1030/$ 1460/$
      1160 1170 1220/$ 1340/$ 1350/$ 1360/$ 1370/$ 1380/$ 1390/$ 1400/$ 1420/$
       2650/$ 2680/$
      1430/$ 1440/$ 1450/$ 1470 1510
      1120 1130/2 1140 1150 1190 1490 1500 1510 1530
      1310 1320/2 1330/2 1340 1350 1360 1370 1380 1390 1520 1530
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          Program Listing 2. CAL81 Cross references
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                                                                                  APRIL
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Program Listing 1
                                                                                                                                                                                                                                                                                                                                                                                   1888 RESTORE:CLEAR 588:CLS:PRINT"WELCOME TO THE CALENDA R MAKER":FRINT
1818 INPUT "DO YOU WANT A FICTURE ON YOUR CALENDAR";CS
1828 IF CS="" THEN 1818
1838 IF LEFTS(CS,1)<>"Y" THEN 1288
1848 PRINT:PRINT"WE HAVE FIVE PICTURES FROM WHICH TO CH
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1979 PRINT*2) BUTTERFLY*
1999 PRINT*3) SEAL AND BALL*
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                                                                                                                                                                                                                                                                                                                                                                                                          PRINT"5) PENGUIN"
                                                                                                                                                                                                                                                                                                                                                                                    1110 PRINT
                                                                                                                                                                                                                                                                                                                                                                                                             INPUT "WHICH NUMBER PICTURE DO YOU WART" : F
                                                                     HENNELLE HEN
                                                                                                                                                                                                                                            **********
                                                                                                                                                                                                                                                                                                                                                                                    1138 IF F(1 OR F>5 THEN PRINT "NUST BE FROM 1 TO 5":GOT
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                                                                     TXTOXXXX XXXXXXXX
                                                                                                                                                                                                                                                                                                                                                                                     1158 PRINT: PRINT "LOOKING FOR PICTURE #"; F
                                                               AUL
                                                                                                                          EMPHANISHE ENGINEERING ENGINEE
                                                                                                                                                                                                                                                                                                                                                                                     1160 READ D
                                                                                                                                                                                                                                                                                                                                                                                                             1P D=T THEN 1198
                                                                                                                                                                                                                                                                                                                                                                                    1188 GOTO 1168
1198 PRINT*PICTURE **;F; FOUND*
1288 PRINT*!NPUT"DO YOU WART PERSONALIZATION*;AS
1218 IF AS-"THEN 1288
1228 IF LEFTS(AS,1)<>"Y" THEN DS-"":GOTO 1468
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                                                                                                                                                                                                                                                                                                                                                                                      1270 PRINT"3) PRODUCED FOR (YOUR NAME) BY A TRS-60 MODE
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1298 PRINT"5) BEST WISHES FOR A HAPPY AND PROSPEROUS NE
W YEAR"
                                                               28
                                                                                                                                                                                                                                                                                                                                                 2
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1318 PRINT:INPUT "WHICH PERSONALIZATION NUMBER";G
1328 IF G<1 OR G>6 PRINT "MUST BE BETWEEN 1 AND 6":GOTO
                                                                       OCTOE MENTE CONTROL CO
                                                                                                                                                                                                                                                                                                                                                                                                                1316
                                                                                                                                                                                                                                                                                                                            NOV
                                                                                                                                                                                                                                                                                                                                                                                        1338 IF G=1 OR G=3 LINEINPUT "NAME? "; B$: IF 85=""THEN 1
                                                                                                                                                                                                                                                                                                                                                                                       1348 IF G=1 THEN D$="THIS CALENDAR MADE ESPECIALLY FOR "+85"
                                                                                                         Ш
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                                                                                                                                                                                                                                                                                                                                                                                                                OMPUTER"
                                                                                                                                                                                                                                                                                                                                                                                       1368 IF G=3 THEN DS="PRODUCED FOR "+BS+" BY A TRS-88 MO DEL 1"
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                                                                                                                                                                                                                                                                                                                                                                                        1360 IF G-5 THEN DS- BEST WISHES FOR A HAPPY AND PROSPE
ROUS NEW YEAR
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..... Add \$14.00

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Dept. 8M

```
1430 INPUT "IS THIS OK"; ES
1440 IF ES="" THEN 1430
1450 IF LEFTS(ES,1)<>"Y" THEN 1200
1460 IF LEFTS(CS,1)<>"Y" THEN 2310
1470 READ E, H
                   ":LPRINT" ":LPRINT" "
1488 LPRINT"
1498 READ F
1500 IF F=99 THEN 2310
1510 IF F= -1 THEN LPRINT" ": LPRINT TAB(E);: GOTO 1490
1528 READ G
 1530 LPRINT STRING$(F,32);STRING$(G,H);
1548 GOTO 1498
1558 'MOUSE DATA
 1560 DATA 81,10,00
1578 DATA -1,43,6,-1,42,8,-1,41,18,-1,41,18,-1,3,4,34,1 8,-1,1,18,4,4,23,8,-1 1588 DATA 0,13,1,3,26,6,-1,8,16,17,15,-1,1,15,14,18,-1,
2,14,7,2,3,2,2,4,2,10,-1
1598 DATA 4,14,4,3,2,1,4,2,4,11,-1,8,11,3,6,2,4,2,14,3,
1600 DATA 13,7,2,29,1,8,-1,18,42,-1,20,40,-1,21,39,-1,2 4,13,3,11,1,7,-1
1618 DATA 25,6,6,1,2,7,6,5,-1,28,4,2,4,2,4,-1,38,3,5,14
,-1,31,22,-1

1628 DATA 29,12,18,4,-1,27,13,11,4,-1,25,15,11,4,-1

1638 DATA 24,18,7,4,-1,23,28,4,7,-1,22,2,29,1,2,-1

1648 DATA 21,2,3,31,-1,21,3,2,4,2,23,-1,28,9,3,13,1,8,-

1,28,18,2,12,2,7,4,4,-1
 1650 DATA 6,4,10,24,2,3,4,2,-1,4,8,6,23,-1,3,10,4,5,14,
4,-1,3,18,3,4,18,2,7,2,-1
1668 DATA 3,15,21,12,-1,4,13,24,18,-1,5,13,25,9,-1,7,11
,25,18,-1,8,9,24,12,-1
1678 DATA 9,7,23,13,-1,18,5,23,13,-1,99
 1680 'BUTTERFLY DATA
 1698 DATA 82,16,37
 1788 DATA -1,20,1,7,1,-1,21,1,5,1,-1,21,1,5,1,-1
1710 DATA 21,1,5,1,-1,22,1,3,1,-1,22,1,3,1,-1
1720 DATA 22,1,3,1,-1,22,1,3,1,-1
 1730 DATA 0,18,13,1,1,1,13,10,-1,8,3,6,4,10,1,1,1,10,4,
 1748 DATA 8,2,1,6,1,5,8,1,1,1,8,5,1,6,1,2,-1
 1750 CATA 0,2,6,3,2,5,5,1,1,1,5,5,2,3,6,2,-1
1760 DATA 1,2,1,3,2,3,1,5,1,3,1,1,1,1,1,3,1,5,1,3,2,3,1
1770 DATA 1,2,1,4,2,3,1,5,1,9,1,5,1,3,2,4,1,2,-1
1780 DATA 1,2,1,4,2,3,1,6,1,7,1,6,1,3,2,4,1,2,-1
1790 DATA 2,2,4,4,2,6,1,7,1,6,2,4,4,2,-1
1800 DATA 2,3,1,4,4,6,1,7,1,6,4,4,1,3,-1
1810 DATA 3,12,6,7,6,12,-1,4,6,4,6,2,5,2,6,4,6,-1
1820 DATA 5,3,3,6,3,1,1,5,1,1,3,6,3,3,-1,9,5,3,3,2,5,2,
3,3,5,-1
 1830 DATA 7,5,2,5,1,1,1,5,1,1,1,5,2,5,-1
 1848 DATA 7,4,1,6,1,2,1,5,1,2,1,6,1,4,-1
 1850 DATA 8,3,1,5,1,2,3,3,3,2,1,5,1,3,-1
1860 DATA 9,1,1,5,1,3,3,3,3,3,1,5,1,1,-1
 1878 DATA 10,5,1,4,3,3,3,4,1,5,-1,11,4,1,4,3,3,3,4,1,4,
 1888 DATA 12,2,1,4,4,3,4,4,1,2,-1,15,4,4,3,4,4,-1
1898 DATA 17,2,5,1,5,2,-1,99
 1900
         'SEAL AND BALL DATA
 1910 DATA 83,16,37
                     ,11,18,-1,8,16,-1,5,22,-1,3,26,-1,2,28,-1
 1930 DATA 1,38,-1,0,32,-1,0,32,-1,0,32,-1,0,32,-1,0,32,
 1940 DATA 0,32,-1,1,30,-1,2,20,-1,3,26,-1,5,22,-1,8,16,
 1950 DATA 11,10,-1,15,1,-1,14,3,-1,14,4,-1,13,7,-1,13,3
 1960 DATA 13,9,-1,13,10,-1,13,10,-1,12,10,-1,11,10,-1,1
 1978 DATA 9,14,-1,9,17,-1,8,21,-1,8,24,-1,8,26,-1,8,28,
 1980 DATA 8,30,-1,8,31,-1,8,32,-1,9,32,-1,9,32,-1,10,32
 1990 DATA 10,32,-1,8,8,1,25,-1,6,8,5,23,-1,4,7,11,20,2,
 2000 DATA 4,5,22,11,1,4,-1,3,3,26,6,1,8,-1
 2010 DATA 32,6,2,5,-1,31,6,-1,30,5,-1,29,5,-1,99
2020 'AIRPLANE DATA
 2030 DATA 84,10,37
  2040 OATA -1.45.5.-1.43.8.-1.41.10.-1.40.3.3.5.-1.39.3.
 2050 DATA 1,4,-1,39,2,1,5,1,3,-1,38,3,1,5,1,2,-1,37,5,1
 ,3,1,3,-1
2060 DATA 36,7,3,3,-1,35,13,-1,35,13,-1,26,5,3,13,-1,26
 ,6,1,14,-1
2070 DATA 27,19,-1,27,19,-1,28,17,-1,29,16,-1,22,5,2,15
 2070 DATA 27,19,-1,27,19,-1,28,17,-1,29,16,-1,22,5,2,15
,-1,22,6,1,15,-1
2080 DATA 13,4,6,20,-1,11,8,4,19,-1,18,18,4,18,-1,18,12
,3,16,-1,18,14,1,15,-1
2098 DATA 10,29,-1,11,27,-1,13,25,-1,14,23,-1,16,21,-1,18,18,-1,11,4,3,28,-1
2100 DATA 10,7,1,22,-1,18,31,-1,11,31,-1,12,31,-1,13,32
,-1,6,4,3,33,-1
 2110 DATA 6,6,1,15,2,18,-1,6,21,6,16,17,2,-1,7,19,10,15,14,3,-1
 2120 DATA 8,17,14,13,11,5,-1,8,16,17,13,6,7,-1,7,16,20, 13,1,9,-1,6,16,23,20,-1
2130 CATA 5,16,26,17,-1,4,16,29,14,-1,3,16,32,11,-1,3,1
         5,34,9,-1,2,15,34,11,-1
                                                                    Program continues
```

```
2148 DATA 1,3,3,9,35,11,-1,1,2,1,3,1,7,36,11,-1,0,2,1,5
,1,5,30,6,2,2,-1
2150 DATA 0,2,1,5,1,4,38.7,-1,0,3,1,3,1,4,39,6,-1,0,4,3
,3,41,5,-1,0,9,42,4,-1
2160 DATA 1,7,43,3,-1,2,5,44,2,-1,51,1,99
2170 'PENGUIN DATA
2180 OATA 85,25,37
2190 DATA -1,12,8,-1,9,13,-1,8,6,2,6,-1
2200 OATA 5,18,-1,3,20,-1,2,2,4,15,-1,8,15,-1,6,2,3,12,
2210 DATA 5.2.6.10.-1.4.2.8.10.-1.3.2.10.5.1.3.-1
2228 DATA 2,2,11,6,2,3,-1,1,2,12,8,-1,0,2,13,11,-1
2238 DATA 8,2,13,14,-1,0,2,13,17,-1,0,2,13,19,-1
2248 DATA 8,2,13,21,-1,8,2,13,22,-1,8,2,13,13,3,7,
225% DATA 0.2.13.14.4.6.-1.1.2.13.13.5.5.-1.1.2.13.13.6
2268 OATA 1,2,14,12,7,4,-1,1,2,15,11,8,3,-1,1,2,16,9,18
2278 DATA 2,2,16,8,-1,2,2,16,8,-1,3,2,16,7,-1,3,2,17,6,
2280 DATA 4,2,16,6,-1,5,2,15,5,-1,6,2,15,4,-1,8,2,13,3,
2298 DATA 18,3,18,2,-1,12,11,-1,12,2,7,2,-1,7,7,7,2,-1
2300 DATA 6,6,7,4,-1,17,5,-1,16,4,-1,99
2310 LPRINT ":LPRINT ":LPRINT"
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2380 LPRINT"
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2390 LPRINT"
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7 8 9 10
8 9 10 11 12 13 14"
2488 LPRINT* 4 5
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19 20 21
2410 LPRINT"11 12 13 14 15 16
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2428 LPRINT*18 19 28 21 22 23 24
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27 28 22 23 24 25 26 27 28 * 2436 LPRINT*25 26 27 28 29 30 31
                                               30 31 LPRINT
2440 LPRINTS
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2450 LPRINT
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2468 LPRINT" 5 6 7 8
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- 22 23 24 25 17 18 19 28 21 21 22 23 24 25 26 27" 18 29 38
2498 LPRINT 26 27 28 29 38
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2500 LPRINT
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2510 LPRINT
                                         JULY
                                                                                                      AUGUST
                                                      SEPTEMBER": GOSUB2718
2528 LPAINT
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2530 LPRINT" 5
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2558 LPRINT"19 28 21 22 23 24 25 16 17 18 19 20 27 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 22 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28 21 28
21 22 28 21 22 23 24 25 26"
2568 LPRINT"26 27 28 29 30 31
28 29
2528 29
2578 LPRINT
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2580 LPRINT"
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2590 GOSUB 2710
2600 LPRINT
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                                                          1 2 3 4 5"
9 10
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2618 LPRINT
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                                                                  10 11 12
             13 14
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                                                                 /
17 18 19 15 16 17 18 19
2628 LPRINT"11 12 13 14 15 16 17
                                          13
2638 LPRINT"18 19 28 21 22 23 24 22 23 24 25 26 27 28 28 29 21 22 23 24 25 26 "
2640 LPRINT"25 26 27 28 29 30
                                                                                      29 38
                                         27 28 29 38 31"
2650 I=(00-LEN(O$))/2
2660 LPRINT ":LPRINT" ":LPRINTTAB(I)D$:LPRINT" ":LPRIN
2678 PRINT: INPUT "DO YOU WANT TO MAKE ANOTHER CALENDAR"
2680 IF AS="" THEN 2670
2690 IF LEFTS(AS,1)="Y" THEN 1000
2788 PRINT: PRINT"END OF PROGRAM": PRINT; END
2710 LPRINT
         LPRINT" S M
                                                                                                  TWT
                                                      T
                                                            W
2738 LPRINT" -
2748 RETURN
```



Don't be misled by more expensive imitations!

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- And a little imagination!!

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Steve is one of the Best Assembly Lang, programmers around, and he has come up with PEN BASIC. This low memory routine will add to more commands to Level II such as PENGET which searches the entire screen for the pen and returns a number between 0-1024 in about 1 sec. Plus % other commands. Perfect for you lightware authors and NEW light pen owners too!.....only \$14.95

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Date		רו ר

Be different! Send an electronic Christmas card with an 80 hallmark this year.

Holiday Cheer

Norman S. Kerr 1571 Burton St. St. Paul, MN 55108

ast Christmas, I decided to let Max, my friendly TRS-80, write personalized holiday letters. You can do the same! The two progrems you need are e computerized address list and a letter writing progrem.

I have written an eddress list progrem that stores information in a two-dimensional array (Teble 1). I have used a salutation entry permitting you to use "Norman S." in the mailing address while using "Sylvie and

Norman" in the salutation of your yuletide letter. "Special intereste" allows you to include a statement about each person's hobby or profession. (If you can't think of anything to say here, the letter writing program will substitute "leisure time" whenever this statement is missing).

The subroutine in lines 6140-6190 permits you to remove names from your address list.

Program Listing 1 produces a copy of the address list on your line printer. It also allows you to record your receipt of cards at the end of the season.

Updating

Once you have your Christ-

VALUE OF J	LISTED PROGRAM
1	LAST NAME
2	FIRST NAME
3	STREET ADDRESS
4	CITY
5	STATE
6	ZIP CODE
7	CARD RECEIVED?
8	SALUTATION
9	SPECIAL INTEREST
	Table 1

CHRISTMAS 1980

DEAR UNCLE HAYNE

MERRY CHRISTMAS. THE KERRS ASKED ME TO WRITE THEIR WINTER SOLSTICE LETTER FOR THEM THIS YEAR.

I HOPE YOU HAVE HAD AS CHOOL A YEAR AT BO PINE STREET AS WE HAVE HAD AT 1571 BURTUN STREET. I DO NOT WISH ON YOU IN PETERBOROUGH, NEW HAMPSHIRE AS MUCH COLD HEATHER AS WE HAVE HAD.

NOTE THAT I HAVE LEFT SPACES TO INDICATE A NEW PARAGRAPH. IF YOU WRITE LINES THAT ARE APPROXIMATELY THE WIDTH TO BE PRINTED YOU WILL SAVE A GOOD LEAL OF TIME PRINTING OUT YOUR CHRISTMAS LETTLE, AS THE COMPUTER WILL NOT HAVE TO EXTENSIVELY PROCESS EACH LINE BEFORE IT SENDS IT TO THE LINE PRINTER.

BE CERTAIN TO MENTION NEWS AROUT EACH MEMBER OF THE FAMILY: MORRAN HAS HAD AN ARTICLE PUBLISHED IN 80-MICROCOMPUTING, WE HOPE YOU HAVE HERN ENJOYING YOUR PUBLISHING MAGAZINES DURING THE FAST YEAR.

HERE'S HOPING YOU HAVE HAPPY HOLIDAYS AT PETERBOROUGH AND A HAPPY AND PROSFEROUS NEW YEAR.

Program Listing 1

- 1 REM CHRISTMAS ADDRESS 2 REM BY NORMAN S. KERR 3 REM 1571 BURTON STREET REM CHRISTMAS ADDRESS PROGRAM

- 4 REM ST. PAUL, MINNESOTA 55188 5 REM TO 8E USED TOGETHER WITH CHRISTMAS LETTER PROGRAM

Program continues

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BASIC LINK FACILITY 'BLINK' (Mod I Min 32K 1-disk) \$25 Mod I, \$50 Mod II * * NEW * *

Link from one BASIC program to another saving all variables! The new program can be smaller or larger than the original program in memory. The chained program may either replace the original program, or can be merged by statement number. The statement number where the chained program execution is to begin may be specified!

INFINITE BASIC \$49.95 (Mod I Tape or Disk)

RACET

RACET UTILITIES

RACET

Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

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Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, -, *, /. Binary search of sorted and unsorted arrays. Hash codes.

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Command Processor. Auto your disk to perform any sequence of instructions that you can give from the keyboard. DIR, FREE, pause, wait for user input, BASIC, No. of FILES and MEM SIZE, RUN program, respond to input statements, BREAK, return to DOS, etc. Includes lowercase driver software, debounce and screenprint!

\$24.95 Mod I, \$50.00 Mod II (Mod I Tapa or Disk — Specify Memory Size)

Generalized Subroutine Facilities. The STANDARD against which all other sorts are compared! Machine language — fast and powerful! Multi-key multi-variable and multi-key character string. Zero and move arrays. Mod II includes USR PEEKS and POKES, Includes sample programs.

DSM \$75.00 Mod I, \$150.00 Mod II. (Mod I Min 32K 2-drive system. Mod II 64K 1-drive)

Disk Sort/Merge for RANDOM files. All machine language stand-alone package for sorting speed. Establish sort spacification in simple BASIC command File. Execute from DOS. Only operator action to sort is to change diskettes when requested! Handles multiple diskette files! Super fast sort times — improved disk I/O times make this the fastest Disk Sort/Merge available on Mod I or Mod II.

UTILITY PACKAGE \$150.00 (Mod II 64K)

Important enhancements to the Mod II. The file recovery capabilities alone will pay for the package in even one application! Fully documented in 124 page manual! XHIT, XGAT, XCOPY and SUPERZAP are used to reconstruct or recover data from bad diskettes! XCOPY provides multi-file copies, 'wild-card' mask select, absolute sector mode and other features. SUPERZAP allows examine/change any sector on diskette including track-0, and absolute disk backup/copy with I/O recovery. DCS builds consolidated directories from multiple diskettes into a single display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutina calling, program looping, dynamic disassembly and more!!

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```
19 CLEAR 18822
10 CLEAR 100000
28 DIM AS(188,8), 1$(9)
38 I$(1)="LAST NAME": 2$(2)= "PIRST NAME"
48 I$(3)="STREET ADDRESS": 1$(4)="CITT": 1$(5)= "STATE"
58 I$(6)= "ZIP CODE": 1$(7)= "CARD RECEVED"
68 I$(8)= "SALUTATION": 2$(9)="SPECIAL INTERESTS"
199 CLS
119 PRINT: PRINT MENU -
118 PRINT: PRINT" MEMU - "
128 PRINT; "1 RETRIEVE LIST FROM CASSETTE"
138 PRINT;, "2 SAVE LIST ON CASSETTE"
148 PRINT;, "3 DISPLAY LIST"
158 PRINT;, "4 ADD MAMES TO LIST"
168 PRINT;, "5 EDIT LIST"
178 PRINT;, "6 ALPNABETITE LIST"
175 PRINT;, "6 ALPNABETITE LIST"
175 PRINT;, "7 FINISRED WITH PROGRAM"
188 INPUT "MAKE YOUR CHOICE";A
199 ON A GOTO 1883, 2883, 3883, 5883, 5883, 7883
1888 REM RETRIEVE LIST FROM CASSETTE
1818 CLS: PRINTS 128, "LOAD TAPE AND PRESS 'PLAY'"
1828 PRINT: INPUT "HIT 'ENTER' TO CONTINUE";D
 1030 IH-8
1848 I=IN:PRINT:PRINT*TAPE READ IN PROGRESS.*

1858 I=I+1: INPUT0-1,A$(I,1), A$(I,2),A$(I,3),A$(I,4),A

$(I,5),A$(I,5),A$(I,7),A$(I,8),A$(I,9)
1868 IF A$(I,1)<> "END OF FILE" THEN GOTO 1858
1878 I=I-1
1888 PRINT: PRINT I " RECORDS READ"
1888 INPUT "BIT 'ENTER' TO CONTINUE";D
 1188 GOTO 188
 2000 REM STORE LIST ON CASSETTE
2010 CLS:PRINT0320, "LOAD TAPE - PRESS 'PLAY' AND 'RECORD'"
 2928 IMPUT "BIT 'EMTER' WHEN READY TO CONTINUE";D
 2838 II=I
2848 A$(II+1,1)="END OF FILE"
 2858 FOR I=1 TO II+1
2868 PRINTS-1,AS(I,1),AS(I,2),AS(I,3),AS(I,4),AS(I,5),A
S(I,6),AS(I,7),AS(I,8),AS(I,9)
 2978 NEXT I
 2886 I=II
2898 PRINT:PRINT I "RECORDS SAVED ON TAPE"
2138 INPUT "PRESS 'ENTER' TO CONTINUE",D
  211# GOTO 18#
 2118 GOTO 188
3888 REN DISPLAY LIST
3818 PRINT:PRINT "-1 DISPLAY LIST ON CRT"
3828 PRINT"-2 PRINT LIST ON LIME PRINTER"
3838 PRINT"-3 RETURN TO MAIN NEHU"
3848 1HPUT "MAXE YOUR CROICE (1, 2, DR 3)";A
 3850 ON A GOTO 3188,3280,188
3180 REM DISPLAY LIST ON CRT
3120 FOR 1=1 TO II
  3130 FOR J=1 TO 9
 3148 PRINT IS(J)":";
3158 PRINT, A$(I,J)
 3158 MEXT J
3178 HAPUT "PRESS 'ENTER' TO CONTINUE";D
3188 CLS: HEXT I
3198 I=II:GOTO 188
  3288 REM PRINT ON LINE PRINTER
  3218 II=I
 3218 CLS:PRINT MAKE CERTAIN LINE PRINTEN IS TURNED ON. 3238 INPUT "PRESS 'ENTER' TO CONTINUE";D 3248 FOR J=1 TO 9 3252 LPRINT IS(J)
  3269 HETT J
3271 LPRINT
  3288 FOR I=1 TO II
3292 FOR J=1 TO 8
  3302 LPRINT AS(I,J)
 3310 HEXT J
  3328
                LPRINT
  3330 HEXT 1
  334# I=II
 3350 LPRINT CHR$(11)
3360 GOTO 3000
4000 REN ADD HAMES TO LIST
  4816 CLS: I=I+1
  4828 FOR J=1 TO 9
4838 PRINT IS(J);
4848 IMPUT AS(I,J)
 4858 HEIT J
4868 PRINT; PRINT, "-1 SAVE THIS ENTHY"
4872 PRINT; "-2 EDIT THIS ENTHY"
4888 PRINT, "-3 DISCARD THIS ENTRY"
4889 INPUT "CHOOSE 1, 2, OR 3"; A
4188 ON A GOTO 4288, 4388, 4488
4260 REM SAVE THIS ENTRY
4210 CLS: PRINT; PRINT; "-1 MAKE AN ADDITIONAL ENTRY"
4228 PRINT; "-2 RETURN TO MAIH NEMU"
4238 INPUT "CHOOSE 1 OR 2"; A
4248 ON A GOTO 4888, 188
4368 EPH EDIT THIS ENTRY
  4858 HERT J
  4388 REM EDIT THIS ENTRY
4318 GOTO 5488
  4482 REM DISCARD THIE ENTHY
  4418 I=I-1: GOTO 4282
  4418 I=I-1: GOTO 4289
5898 REN ZDIT ENTRIES
5818 PRINT:PRINT;"-1 EDIT ENTIRE LIST"
5828 PRINT;"-2 EDIT ONE ITEM
5838 INPUT "CHOOSE 1 DR 2";A
```

```
5100 REM EDIT ENTIRE LIST
511# CLS: II=I
5113 CLS: 11-2

5123 FOR I=1 TO II

5138 FOR J=1 TO 9

5148 FRINT J; +" "+IS(J)+": "+AS(I,J)
5150 NEXT J
5169 PRINT'10 FIHISBED EDITING"
5165 PRINT" 11 EDIT HETT ITEM"
5179 INPUT "WHICH ITEM DO YOU WISN TO CBANGE";A
5188 IF A=18 GOTO 188
5185 IF A=11 THEN HEXT I
5198 IMPUT A$(I,A)
5288 GOTO 5138
5388 REM EDIT ONE ITEN
5318 CLS: IHPUT "LAST HAME OF ITEM TO BE EDITED"; B$
5328 II=I
533# FOR I=1 TO II
5348 IF A$(1,1)=B$ THEN GOTO 5482
5358 NEWT I
5368 I-II
5378 PRINT'SORNY THAT ITEN NOT FOUND'
5388 INPUT "PRESS 'ENTER' TO CONTINUE";D
5389 INPUT "PRESS 'ENTER' TO CONTI
5389 GOTO 188
5488 REN EDIT ONE ITEM
5418 FOR J=1 TO 9
5428 FRINT J" "+1$(J)+": "+A$(I,J)
5438 HEXT J
5448 PRINT "18 - PIHISHED EDITING"
5458 IHPUT "MAKE YOUR CHOICE";A
5468 IF A-12 THEN GOTO 188
5478 PRINT "REENTER LINE "A
5488 IMPUT A$(I,A)
5498 GOTO 5418
6888 REN ALPHABETIZE LIST
6818 CLS:PRINT:PRINT"ALPBABETIZING
6929 IH=1
6938 FDR I=1 TO IH-1
6848 POR J=I TO 8: A$(8,J)=A$(I,J):HEXT J:L=I
6858 POR II=I+I TO IN
6868 IF A$(8,1)<-A$(II,1) THEN GOTO 6888
6979 POR J=1 TO 9: A$(8,J)=A$(II,J):NEXT J: IL=II
6989 NEXT II
6898 FOR J=1 TO 8: A$(E,J)-A$(IL,J): NEXT J
6188 FOR J=1 TO 8: A$(IL,J)=A$(I,J):HEXT J
6118 FOR J=1 TO 8: A$(I,J)=A$(8,J): HEXT J
6128 HEXT I
6125 I-IH
6138 II-I: I-1
6148 IF A$(I,1)<>"" THEN I=II: GOTO 188
615# FOR I=1 TO II
616# FOR J=1 TO 9: A$(I,J)=A$((I+1),J): HEXT J
6178 NEXT I
6188 I=II-1
6198 GOTO 6138
7888 REM EXIT PROGRAM
7818 PRINT"HAVE YOU SAVED YOUR LIST ON CASSETTE"
7828 PRINT"-1 YES -2 NO"
/#Z# PKINT"-1 YES -2 NO"
7838 IHPUT "ENTER 1 OR 2";A
7840 IF AC>1 THEM GOTO 188
7858 PRINT "GDODBYE FON NOW. hope I CAN NORK NITH YOU LATER".
```

Program Listing 2

```
REM CHRISTMAS LETTER PROGRAM

REM 8Y NORMAN S. KERR

REM 1571 BURTON STREET

REM ST. PAUL, HINNESOTA 55188

REM TO 8E USED TOGETHER WITH CHRISTMAS ADDRESS LIST

CLEAR 18809: DEFINT A-K: DIM A$(100,0), B$(58)

CLES: PRINTO 328, "LOAD CHRISTMAS LIST ADDRESS TAPE A
ND PRESS 'PLAY'"

REM INPUT "HIT 'ENTER' TO CONTINUE"; D

INFORMATION OF THE PRINT: PRINT TAPE READ IN PROGRESS."

INFORMATION OF THE PRINT: PRINT TAPE READ IN PROGRESS."

INFORMATION OF THE THEM SET THEM 68

INFORMATION OF THE THEM 68

REM PRINT: PRINT I "RECORDS READ"

REM PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT: PRINT: PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT: PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT: PRINT: PRINT: PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT: PRINT: PRINT: PRINTER TO CONTINUE"; D

REM PRINT: PRINT:
```

5948 ON A GOTO 5188,5388

I'M A BELIEVER!!

"I Love it !!... It's really a incredible O/S. It' just great! Now I see why people who have seen it say they are now believers. I know I am." LANCE MICKLUS

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VTOS 4.0

VTOS 4.0

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- Non-BREAKable AUTO and CHAIN 16)
- 19) Wild-card DIRectory. Permits you to locate all files of a certain classification such as '/eAS'. classification such as '/eAS'. Uniformly indicates file size in K (1024 bytes) resardless of drive type. "DIR D" would give you all your files that start with "O".
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NOT WISE ON YOU"

1070 B\$(6)="18 "+A\$(1,4)+", "+A\$(1,5)+" AS HUCH COLD WE ATBER AS WE HAVE BAD."

1860 B\$(8)=" NOTE THAT 1 HAVE LEFT SPACES TO INDICA-TE A NEW PARAGRAPH. 1898 BS(9)="IF YOU WRITE LINES THAT ARE APPROXIMATELY T BE NIDTH TO BE 1100 B\$(10)="PRINTED YOU NILL SAVE A GOOD DEAL OF TIME PRINTING OUT YOUR"

1118 B\$(11)=" CHRISTHAS LETTER, AS THE COMPUTER NILL NO
T HAVE TO" 1128 B\$(12)="EXTENSIVELY PROCESS EACH LINE BEFORE IT SE NDS IT TO THE LINE PRINTER. 1140 B\$(14)=" BE CERTAIN TO MENTION NEWS ABOUT EACH MEMBER OF THE FAMILY:"
1150 B\$(15)=" NORMAN HAS HAD AN ARTICLE PUBLISHED I 8B-HICROCOMPUTING NE HOPE YOU HAVE BEEN ENJOYING YOUR 1160 B\$(16)= B\$(16)=" ME HUFE 100 HAR."

+ A\$(1,9)+" DURING THE PAST YEAR."

B\$(17)=" HERE'S NOPING YOU HAVE HAPPY HOLIDAYS

TROCEPROTIS NEW YEAR "+A\$(I,4)+" AND A HAPPY AND PROSPEROUS NEW YEAR 1186 B\$ (18) 1190 B\$(19)=' 2006 RETURN MAX* 10000 REM PRINT ON LINE PRINTER 10B2B II-I 18836 FOR I=1 TO II 18848 COSUB 1888 18850 LPRINT CHR\$(14) CH 18860 LPRINT CHR\$(15): LPRINT: LPRINT CHRISTMAS 1988" 1887 FOR N=8 TO 19: REN CHANGE TOP NUMBER TO NUMBER IN 10000 LA=LEN (B\$ (N)) 1009B IF LA<65 AA\$=B\$(N): GOTO 18250 18188 X=68 18118 AA\$=LEFT\$(B\$(N),X) 10120 IF RIGHT\$(AA\$,1)<>CHR\$(32) X=X-1: COTO 10110 18138 TRELA-LEN (AAS) 1814B IF LB<6B AB\$=MID\$(B\$(N),(X+1),LB): GOTO 18258 18150 Y=60 10160 ABS=HID\$(B\${N},(X+1),Y)
18178 IF RIGHT\$(AB\$,1)<>CHR\$(32) Y=Y-1: GOTO 10160 1B186 LC=LB-LEN(AG\$) 18198 IF LC<68 AC\$=MID\$(B\$(N),(X+Y+1),LC): COTO 18258 18218 ACS=MIDS(BS(N), (X+Y+1),Z 10220 IF RIGHT\$ (AC\$,1) <> CHR\$ (32) Z=Z-1: GOTO 18210 1B230 LD=LC-LEN (AC\$) 16246 ADS=MIDS(BS(N), (X+Y+Z+1), LD) + AA\$ 10250 LPRINT" 10260 IF LEN(AB\$)>1 LPRINT "
10270 IF LEN(AC\$)>1 LPRINT " "+ACS "+ AD\$ IRRAG IF LEN(ADS)>1 LPRINT" 18298 AA\$="": AB\$="": AC\$="": AD\$="" 16366 NEXT N 10310 LPRINT CHR\$(11) 10328 NEXT I 1B33B IRSAR END

mas mailing list stored on a computer file, you need to update this file only once a year. As you receive cards from your friends, check their mailing addresses and make any necessary corrections. Then on a cold night in January transfer the necessary corrections to your computer tile. If you wish, you can record the receipt of a card while in the 'edit entire file' mode.

Letter-writing (Program Listing 2) is quite simple. The address list is stored in the two-dimensional string array A\$(I,J). The message to be printed is stored in the string array B\$(W). Elements of the A\$(I,J) array should be incorporated into B\$(W) as often as possible—this is what personalizes your Christmas letters.

Once you have finished writing your letter, you will know the value of W, which must be changed in the line-print routine in line 10070. It is important that B\$(W) arrays be raioaded after each letter has been printed and I has been incremented, so that the new elements from A\$(I,J) will be printed with each letter.

Margin Routine

An important feature of the line printer routine, which may be useful in other programs, is included between lines 10080-10290. These lines prevent words from being split at the end of the printer's line. I arbitrarily set the margins at 10 spaces (lines 10260-10280) and set the printer's line at 60 characters and spaces in lines 10100, 10150, and 10200.

When typing in your B\$(W) statements, you should try to cut down the use of this subroutine by keeping most lines at less than 60 characters. If you make too frequent use of this teature, you will think that your computer has crashed when the printer pauses (an understatement) in the middle of a letter. The program as presented in the Sample Letter causes no such hang-ups.

My TRS-80 is named Max. Substitute your computer's name here, or reword this portion of the letter to your taste. Max is a TRS-80, LEVEL II, with 32K RAM and an Anadex DP-8000 printer. The CHR\$(14) in line 10050 causes the Anadex to print in boldface. The CHR\$(15) in line 10060 restores it to normal printing.

Before attempting to produce individualized letters for your entire list, construct a dummy list containing, say, three entries. This will enable you to be certain your program is debugged, and allow you to set the top of page at the appropriate place on your printer.

I hope you will enjoy the program. If you don't send Christmas letters, send them out on Valentine's Day!

146





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	3. FEDERAL FICA & WITHHOLDING TAX
	3. COMPUTATIONS
	4. HOME BUDGET ANALYSIS
	5. ANNUITY COMPUTATION
	4. HOME BUDGET ANALYSIS 5. ANNUITY COMPUTATION 6. UNIT PRICING 7. CHANGE FROM BURGHASE 8 BUSINESS
	7. CHANGE FROM PURCHASE
	8. NEBS CHECK PRINTER
	9. DAYS BETWEEN DATES
	10. MORTGAGE AMORTIZATION TABLE
	11. INVENTORY CONTROL
	12. PORTFOLIO VALUE COMPUTATIONS
	13. VALUE OF A SHARE OF STOCK
	14. SALES RECORD KEEPING SYSTEM
	15. FUTURE VALUE OF AN INVESTMENT
	16. EFFECTIVE INTEREST RATE (LOAN)
	17. PRESENT VALUE OF A FUTURE AMOUNT
	18. RATE OF RETURN-VARIABLE INFLOW
	19. RATE OF RETURN-CONSTANT INFLOW
	20. REGULAR WITHDRAWAL FROM INVESTMENT
	21. STRAIGHT LINE DEPRECIATION
	22. SUM OF DIGITS DEPRECIATION
	23. DECLINING BALANCE DEPRECIATION
	24. BREAK EVEN ANALYSIS
	25. SALVAGE VALUE OF INVESTMENT
	26. PAYMENT ON A LOAN
	27. FUTURE SALES PROJECTIONS
	28. CREDIT CARD FILE
	29. ECONOMIC ORDER QUANTITY (EQQ)
	INVENTORY MODEL
	30. VALUE OF HOUSE CONTENTS 31. TEXT EDITOR 32. MONTHLY CALENDAR PERSONAL
	31. TEXT EDITOR
	32. MONTHLY CALENDAR
	33. DAY OF WEEK
	34. CASH FLOW VS. DEPRECIATION
	34. CASH FLOW VS. DEPRECIATION 35. COMPLETE MAIL SYSTEM FINANCE FINANCE
	36. INTEREST RATE ON A LEASE

STATISTICS AND MATHEMATICS
37. RANDOM SAMPLE SELECTION
38. ANGLO-METIC CONVERSION
39. MEAN, STANDARD DEVIATION,
MAXIMUM AND MINIMUM
40. SIMPLE LINEAR REGRESSION
41. MULTIPLE REGRESSION ANALYSIS GEOMETRIC REGRESSION EXPONENTIAL REGRESSION 43 EXPONENTIAL REGRESSION
SIMPLE MOVING AVERAGE
SIMPLE T-TEST
CHI-SQUARE TEST
NORMAL PROBABILITIES
BINOMIAL PROBABILITY
POISSON PROBABILITY
MATRIX ADDITION AND SUBTRACTION
MATRIX TRANSPOSE STATISTICS 45 MATRIX TRANSPOSE MATRIX INVERSE 52. MATRIX INVERSE
53. MATRIX MULTIPLICATION
54. SOLUTION OF SIMULTANEOUS EQUATIONS
55. QUADRATIC FORMULA
56. LINEAR EQUATION SOLUTIONS
57. ROOT HALF INTERVAL SEARCH
58. ROOTS OF POLYNOMIALS
59. ROOTS NEWTON'S METHODS
60. PRIME FACTORS OF INTEGER
61. LEAST COMMON DENOMINATOR
62. RADIAN-DEGREE CONVERSION
63. NUMERICAL INTEGRATION MATH UTILITIES
64. QUICK SORT ROUTINE
65. PROGRAM STORAGE INDEX
66. MULTIPLE CHOICE QUIZ BUILDER 66. MOLTIPLE CHOICE GOIZ BU 67. FORM LETTER WRITER 68. SHELL SORT 69. CASSETTE LABEL MAKER 70. CODES MESSAGES 71. MERGE TWO FILES 72. SORT WITH REPLACEMENT

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33. HANGMAN
84. GAME OF NIM
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- 43 VALADINF
- 44 UTILITY
- 45 SIMPLEX
- 46 TRANS
- 47 EOQ
- 48 QUEUE1
- 49 CVP 50 CONDPROF
- 51 OPTLOSS
- 52 FQUOQ

NAME

- 53 FOEOWSH
- 54 FQEOQPB
- 55 QUEUECB 56 NCFANAL
- 57 PROFIND
- 58 CAP1

- Interest Apportionment by Rule of the 78's
- Annuity computation program
- Time between dates
- Day of year a particular date falls on
- Interest rate on lease
- Breakeven analysis
- Straightline depreciation
- Sum of the digits depreciation
- Declining balance depreciation
- Double declining balance depreciation
- Cash flow vs. depreciation tables
- Prints NEBS checks along with daily register
- Checkbook maintenance program Mortgage amortization table
- Computes time needed for money to double, triple, etc.
- Determines salvage value of an investment
- Rate of return on investment with vanable inflows
- Rate of return on investment with constant inflows
- Effective interest rate of a loan
- Future value of an investment (compound interest)
- Present value of a future amount Amount of payment on a loan
- Equal withdrawals from investment to leave 0 over
- Simple discount analysis
- Equivalent & nonequivalent dated values for oblig.
- Present value of deferred annuities
- % Markup analysis for items
- Sinking fund amortization program
- Value of a bond
- Depletion analysis Black Scholes options analysis
- Expected return on stock via discounts dividends
 - Value of a warrant
 - Value of a bond
 - Estimate of future earnings per share for company
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 - Option writing computations
 - Value of a right
 - Expected value analysis
 - Bayesian decisions
 - Value of perfect information
 - Value of additional information Derives utility function
 - Linear programming solution by simplex method
 - Transportation method for linear programming Economic order quantity inventory model
 - Single server queueing (waiting line) model
 - Cost-volume-profit analysis Conditional profit tables
 - Opportunity loss tables
 - Fixed quantity economic order quantity model

DESCRIPTION

- As above but with shortages permitted As above but with quantity price breaks
- Cost-benefit waiting line analysis Net cash-flow analysis for simple investment
- Profitability index of a project
 - Cap. Asset Pr. Model analysis of project

- 59 WACC
- 60 COMPBAL 61 DISCBAL
- 62 MERGANAL
- 63 FINRAT
- 64 NPV 65 PRINDLAS
- 66 PRINDPA
- 67 SEASIND
- **68 TIMETR**
- 69 TIMEMOV
- 70 FUPRINE 71 MAILPAC
- 72 LETWRT
- 73 SORT3
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- 76 BUSBUD
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- **80 INVENT2**
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- 87 SELLPR
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- 92 AUTOEXP
- 93 INSFILE 94 PAYROLL2
- 95 DILANAL
- 96 LOANAFFD
- 99 RRCONVBD 100 PORTVAL9
- 97 RENTPRCH 98 SALELEAS

- Weighted average cost of capital
- True rate on loan with compensating ball required
- True rate on discounted loan Merger analysis computations
- Financial ratios for a firm
- Net present value of project Laspeyres price index
- Paasche price index
- Constructs seasonal quantity indices for company
- Time series analysis linear trend
- Time series analysis moving average trend Future price estimation with inflation
- Mailing list system
- Letter writing system-links with MAILPAC Sorts list of names
- Shipping label maker
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- Computes weeks total hours from timeclock info.
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- 4. Foolproof, Step-By-Step procedures are supplied, planned and documented for the First-Time Computer User, All programs are selfexplanatory, telling the user what is required at every step
- 5. Programs are written in BASIC and the source code listing is supplied for those users who decide to modify the original system.
- 6. A complete users manual is supplied with each module.
- 7. Demo Data diskettes are supplied with sample data.
- 8. S.B.S.G. has an In-House staff that can answer questions and problems related to the proper use of the S.B.S.G. Business System (on the telephone or through the mail).
- 9. First-Time Computer Owners Note-Instructions are provided for entering state payroll withholding tables. There is an additional charge if you prefer to have S.B.S.G. Programmers insert the correct data.
- 10. Minimum system requirement is 2-drives to run any single module.
- 11. Minimum system requirement is 3-drives to run the coordinated business system (AR-AP-GL) or (AR-AP-GL with PAYROLL).
- 12. Minimum system requirement is 4-drives to run the extended coordinated system (AR-AP-GL-PR and INVENTORY/INVDICING).
- 13. The A. OSBORNE & ASSOCIATES business manuals are provided FREE with each order (they may be purchased separately at \$20 per manual).
- 14. The INVENTORY and INVOICING modules are original programs written by S.B.S.G.
- 15. Each module can be purchased as independent modules to run on a 2 or more drive system except INVOICING.
- 16. Memory requirement is 48K for the MODEL-II and 64K for the MODEL-II.
- 17. All S.B.S.G. BUSINESS SYSTEMS may be upgraded up to 4-disk drives. No data is ever lost during an upgrade. There is a standard S.B.S.G. charge for all upgrades.

ACCOUNTS PAYABLE

The accounts payable system receives data concerning purchases from suppliers and produces checks in payment of outstanding invoices. In addition, it produces cash management reports. This system aids in tight financial control over all cash disbursements of the business. Several reports are available and supply information needed for the analysis of payments, expenses, purchases and cash requirements. All A/P deta feeds General Ledger so that data is entered into the system just once. These programs were developed 5 years ago for the Wang micro-computer and have been tested in many environments since then. The package has been converted to the TRS-80* and is now well documented, on-line, interactive micro-computer system with the capabilities of (or exceeding many larger systems).

CAPABILITIES:

- menu driven; easy to use; full screen prompting and cursor control
- invoice oriented; everything revolves around the invoice; handles new invoice or credit memo or debit memo
 invoce information recorded; invoice #, description, buyer, check register #, invoice date, age date, amount of invoice, discount (in %), freight, tax (\$), total payable
- * transaction print and file maintenance procedures insure accuracy flexible check calculation procedure; allows checks to be calculated
- for a set of vendors-or-for specific vendors program prints your checks; contiguous computer checks with your company letterhead can be purchased from SBSG
- reports include (samples on back):
 - open item listing/closed item listing both detail and summary
 - debit memo listing/credit memo listing
- aging
 check register report (to give an audit trail of checks printed)
 vendor listing and vendor activity (activity of the whole year)
 tully linked to GENERAL LEDGER each invoice can be distributed. to as many as five (5) different GL accounts; system automatically posts to cash and A/P accounts

ACCOUNTS RECEIVABLE

The objective of a computerized A/R system is to prepare accurate and timeley monthly statements to credit customers. Management can generate information required to control the amount of credit extended and the collection of money owed in order to maximize profitable credit sales while minimizing losses from bad debts. The programs composing this system were developed 5 years ago, especially for small businesses using the Wang Microcomputer. They have been tested in many environments since then. Each module can be used stand alone or can feed General Ledger for a fully integrated system.

CAPABILITIES:

- menu driven; easy to use; full screen prompting and cursor control invoice oriented; invoices can be entered before ready for billing,
- when ready for billing, after billing or after paid allows entry of new invoice, credit memo, debit memo, or change/ delete invoice
- allows for progress payment transaction information includes:
 - . type of A/R fransaction billing date
 - customer P.O. general ledger account number
 invoice amount description of P.O.
- shipping/transportation charges
- tax charges payment
- progress payment information
- transaction print & file maintenance procedures insure accuracy customer statements printed; computer statements with your compay letterhead can be purchased from SBSG reports include; (samples on back)

 • listing of invoices not yet billed
- - open items (unpaid invoices)
 - · closed items (paid invoices)
- aging
 fully linked to General Ledger; will post to applicable accounts; debit A/R, credits account you specify

••• EVERYTHING FOR YOUR TRS-80 •••

PAYROLL

Payroll invoices many complex calculations and the production of reports and documents, many of which are required by government agencies. It is an ideal candidate for the computer. With this Payroll system in-house, you can promptly and accurately pay your employees and generate accruate documents/reports to management, employees, and appropriate government agencies concerning earnings, taxes, and other deductions. The package has been converted to the TRS-80™ and is now a well documented, op-line, interactive, micro-computer system with the capabilities of (or exceeding) many larger systems.

CAPABILITIES:

- * performs all necessary payroll tasks including:
 - · file maintenance, pay data entry and verification
 - computation of pay and deduction amounts
- printing of reports and checks can handle salaried and hourly employees
- employees can receive:
 - hourly or salary wage
 vacation pay

 - holiday pay
 - piecework pay
 - overtime pay
- employees can be paid using any combination of pay types (except,
- hourly cannot receive salary and salary cannot receive hourly) special non-taxable or taxable lump sums can be paid regularly or one time (bonus, reimbursements, etc)
- health and walfare deductions can be automatically calculated for each employee
- earnings-to-date are accumulated and added to permanent records; taxes are computed and deducted: US income lax, Social Security tax, state income tax, other deductions (regular or one time) paychecks are printed; computer checks with your company letter-
- head can be purchased from SBSG
- calculations are accumulated tor; employee pay history, 941A report, W-2 report, insurance report, absentee report
- fully linked to General Ledger. Each employee's payroll information can be distributed to as many as (12) twelve different GL accounts; system automatically posts to cash account

INVENTORY CONTROL/INVOICING

- * ISAM (Indexed Sequential Access Method) eliminates the necessity for time consuming sort.
- Pre-Allocated Files for IMMEDIATE update and inquiry capabilities.
- Fast Disk storage and retrieval.
- Inventory Master Record includes...class...SKU...Division...Retail... Cost...Beginning Balance...Period Sale Units...Period Receipts...On Order...On Hand...Minimum Reorder Point...Recommended Reorder Amount...Vendor Number...Period Sale Dollars...YTD Sale Units...YTD Sale Dollars.
- Units...YTD Sale Dollars.

 Calculated and Displayed Formulas include...Gross Margin (\$)...
 Gross Margin (%)...Gross Margin ROI (%)...Average Inventory Retail
 (\$)...Average Inventory Cost (\$)...Turn-Over (%).

 Reports Generated include...Master File Listing...Class Description
 Listing...Transaction Audit Trail...Minimum Reorder Point by Vendor...Retail Price List...Period Sales Report
 ...Year to Date Sales Report...Stock Status (Screen or printer output)
 ...Commission Report (for salesmen and buyers).

 Transaction Types include...Sales, Vendor Receipts...Vendor
 Orders...Customer Returns...Vendor Returns...Transfer Stock.

GENERAL LEDGER

The General Ledger accounting system consolidates financial data from other accounting subsystems (A/R, A/P, Payroll, direct posting) in an accurate and timely manner. Major reports include the Income Statement and Balance Sheet and a "special" report designed by management and Balance Sheet and a "special" report designed by managerment. The beauty of this General Ledger system is that it is completely user formatted. You "customize" the account numbers, descriptions, and report formats to suit particular business requirements. These programs were developed 5 years ago for the Wang micro-computer and have been tested in many environments since then. The package has been converted to the TRS-80" and is now a well documented on the interactive micro-computer system with the capabilities of for line, interactive micro-computer system with the capabilities of (or exceeding) many larger systems.

CAPABILITIES:

- more than 200 chart of accounts can be handled
- account number structure is user defined and controlled
- more than 1,750 transactions may be entered via:
 - direct posting; done by hand; validated against the account file before acceptance
 - · external posting; generated by A/R, A/P, Payroll or any other user source
- * data is maintained and reported by:
 - month
 - quarter
 - year
 - · previous three quarters
- * reports (samples on back) include:
 - trial balances
 - income statement
 - balance sheef
 - special accounts reports and more.....
- user formats reports with the following designated as you wish:
 - tifles

 - headingsaccount numbers descriptions

 - subtotals totals
 - skip lines
- skip pages
 up to eight levels of totals fully user designated
- menu driven; easy to use; full screen prompting and cursor control



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COORDINATED AR-AP-GL	\$375	\$675
COORDINATED AR-AP-GL with PAYRDLL	\$495	\$899
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COMPUTADNICS

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MICROSOFT BASIC COMPILER

With TRS-80™ BASIC Compiler, your Level II programs will run at record speeds! Compiled programs execute an average of 3-10 times faster than programs run under Level II. Make extensive use of integer operations, and get speeds 20-30 times faster than the interpreter.

Best of all, BASIC Compiler does it with BASIC, the language you already know. By compiling the same source code that your current BASIC interprets, BASIC

Compiler adds speed with a minimum of effort.

And you get more BASIC features to program with, since features of Microsoft's Version 5.0 BASIC interpreter are included in the package. Features like the WHILE..WEND statement, long variable names, variable length records, and the CALL statement make programming easier. An exclusive BASIC Compiler feature lets you call FORTRAN and machine language subroutines much more easily than in Level II.

Simply type in and debug your program as usual, using the BASIC interpreter. Then enter a command line telling the computer what to compile and what options

Voila! Highly optimized, Z-80 machine code that your computer executes in a flash! Run it now or save it for later. Your compiled program can be saved on disk for direct execution every time.

Want to market your programs? Compiled versions are ideal for distribution. You distribute only the object code, not the source, so your genius stays fully protected.

BASIC Compiler runs on your TRS-80" Model I with 48K and disk drive. The package includes BASIC Compiler, linking loader and BASIC library with complete

1980 INCOME TAX PAC

INCOME TAX PAC A ...

Completely Revised - Latest Tax Tables - Fully Tested - Complete Manual and Documentation. The new version of the Income Tax Pacs are full of error catching codes making it impossible to make an error. Follow the simple Step By Step procedure that makes tax preparation simple.

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- Schedule A itemized deductions
- Schedule B interest and dividends
- Output to video display

Schedule TC tax computation

INCOME TAX PAC 8 \$49.95...Cassette or Diskette) For Level II 16K with or without printer...cassette or disk has all features of Income Tax Pac A Plus works with or without line printer.

- Formats Form 1040 and 1040A for standard tax forms

- Schedule C income from a personally owned business

· Form 2106 employee business expense

PROFESSIONAL INCOME TAX PAC C ...

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Using the above factors, the Horse Selector calculates the estimated odds. BET on any selected horse with an estimated payoff (based on Tote Board or Morning

Lines) higher than calculated payoff (based on Horse Selector II).

Source listing for the TRS-80", TI-59, HP-67, HP-41, Apple and BASIC Computers.

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A New enhanced NEWDOS for TRS-80" Model I for the 1980's

Apparat Inc., announces the most powerful Disk Operating System for the TRS-80". It has been designed for the sophisticated user and professional programmer

who demands the ultimate in disk operating systems.

NEWDOS/80 is not meant to replace the present version of NEWDOS 2. 1 which satisfies most users, but is a carefully planned upward enhancement, which significantly extends NEWDOS 2. I's capabilities. This new member to the Apparat NEWDOS' family is upward compatible with present NEWDOS 2. 1 and is supplied on Diskette, complete with enhanced NEWDOS + utility programs and documentation. Some of the NEWDOS/80 features are:

New BASIC commands that supports with variable record lengths up to 4095

Bytes long.

 New BASIC commands that supports with variable record lengths up to 4095 Bytes long.

Mix or match disk drives. Supports any track count from 18 to 80. Use 35, 40 or 77 track 5" mini disk drives or 8" disk drives, or any combination.

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Includes Superzap 3.0 and all Apparat 2.1 utilities.

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Daily overall market, "volume" and "closing Dow" are also provided from a newspaper.

7. Volume and price changes of an issue, as they compare to volume an price changes of the overall market, are the basis of this system's analysis of the given

8. Comparisons of the issue against itself are also done. This may allow the user to spot "unusual" activity on this issue.

Clear indications are given as to whether the issue is "out performing", "under performing" or "performing" with the market.

Complete video and printed output is provided.

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Med Systems!

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The Playful Professor is a mathematics learning aid that provides tutoring in integer mathematics and fractions for the four basic operations. Demonstrated solutions are completed step-by-step in a blackboard format easily understood by grade school children. Problems are presented in a game format that places the pupil in a sixty room mansion. To win, the player must catch the ghost with the key, then get to the front door before the ghost (or other player) recaptures the key. Movement is based on problem solving. Difficulty may be different for each player, allowing parants to be beaten by their children. Recommended for age 4 through adult.

Money Master tutors the young child in the use of money. The child is allowed to wander freely by paying tolls or buying objects. The tutoring screen depicts money graphically, and interactively instructs in the use of coins. This includes making paymenta and receiving change. New mazes are generated for each game. Graphic obstacles are randomly chosen from a library of several dozen. An average game lasts 20-30 minutes. Recommended for early readers through adult.

Each program \$9.95 on cassette for TRS-80 Level II 16K, or Model III 16K. All three on diskette - \$29.95, Model I only.

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Mysteries of the Level II ROM

Victor Griswoid 20 Fieldcrest Drive Jackson, TN 38301

The Level II TRS-80 is an excellent microcomputer, but one does encounter a few difficulties when penetrating the secrets of the Level II reserved RAM. Several diligent software detectives have written articles that do much to show the inner workings of Level II.

I have used the following conventions in this article: Unsigned binary format for numbers stored in RAM will be assumed. Numerals with a D suffix or none at all will be in decimal. Hexadecimal numerals will have an H suffix and have leading zeros to indicate either a one-or two-byte value. The operating instructions for the subroutines and example programs are printed beside the program listings. This, I hope will make easier reading.

The information here came from inspecting the reserved RAM after running many test programs.

Keyboard

The keyboard driver is accessed by CALLing 002BH. The

starting address of the KI device control block (4015H) ia loaded into the Z-80 microprocessor's DE register pair, and some of the other registers are saved. This routine then jumps to the device control block handling routine, which saves the remaining registers (except for IY) and then branches to the DCB driver address. When returned from the driver, the registers are restored, with the accumulator containing the ASCII code of the entered character.

Note that the routine is always in ROM except for one special case explained later. The only way that the keyboard driver can be modified is by changing the DCB driver address bytes. Radio Shack's KBFIX and other custom drivers are new keyboard drivers which might or might not JUMP back into the ROM driver after their task is performed, even if that task would only require one byte of opcode in the ROM driver.

There is one exception to coming out of ROM: the BREAK key. Whenever BREAK is depressed, the keyboard driver performs a ReSTart to 0028H, which in turn makes the Z-80 JUMP to 16396 (400CH) in RAM.

Normally, there is a RETurn instruction in Level II or another JUMP in TRSDOS. There are three bytes available. You can

easily POKE an XOR A (opcode 175D or AFH) and then a RETurn (opcode 201D or C9H) into these RAM locations so that whenever BREAK is depressed, the Z-80 accumulator is cleared before the keyboard driver is left. This affectively disables the BREAK key

In order to provide multi-key rollover, the KI drivers saves an image of the old keyboard memory (except for the space bar) in RAM locations 16438-16444 (4036H-403CH). The first byte is the first row (lowest address), and so on. When directly scanning the keyboard from BASIC (bypassing INKEY\$ for a repeat action whenever a key remains depressed), it is easier to scan this RAM area instead of the keyboard memory because rows of keys are only one byte apart.

Speaking about INKEY\$, RAM location 16537 (4099H) stores the ASCII code of the most recent entered character. This byte is what INKEY\$ references whenever it returns a character to a program. INKEY\$ resets the byte to zero after the reference. Location 16537 can be preset by a POKE in order to have INKEY\$ return a specific character unless a key is depressed.

One last note about the keyboard: avery Level II TRS-80 keyboard can produce ASCII control codes easily and without any hardware or software modification. Simply depress SHIFT and the DOWN ARROW simultaneously, and then depress the appropriate letter key.

VO Buffer

The input/output buffer is not explained in the Level II manual. It is used for program line input and output (LIST), condensing the program lines before they are put into RAM, holding the text during an INPUT statement, and for INPUT# from cassette. It is not used during CLOAD or PRINT#.

The management of the buffer is straightforward. The handler stores input characters in the buffer and puts a code zero after the last valid character for either the ENTER or BREAK terminating character. The storage of other control codes depends on the type of data manipulated at the time. RAM locetions 16551–16552 (40A7H-40A8H) not only control where the handler begins the buffer, but also where BASIC starts interpreting its contents.

This meens that the buffar can be positioned anywhere in nonsensitive RAM (RAM which is not used for BASIC's "house-keeping"), end BASIC won't know the difference. For instance, disk BASIC uses a different buffer than Level II. A pro-

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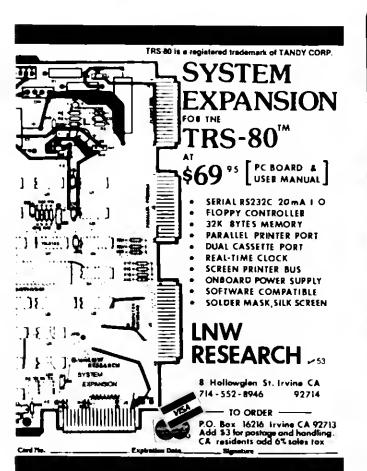
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gram can INPUT directly into a string or into high memory from the keyboard or cassette, or even load data into video memory directly from keyboard or cas-

Maintaining the buffer in video memory for keyboard use is not practical, since BASIC will lock up if the buffer is there while BASIC is in command mode (not due to scrolling). Using this ability for recovery of lost PRINT# cassette files, however, is another metter. The computer will eventually return control to the user after a bad cassette data block has been read, but it is not unusual for the computer to lock up or at least to clear the INPUT# variables instead of putting a value into them. This way you cen at least see the data before the computer forgets it or locks up. Program Listings 1 and 2 illustrate the above points.

BASIC puts a comma in front of the first character of the buffer during an INPUT or INPUT#. It puts a colon three bytes before the first character while in command mode (statement condensing brings the condensed statements two characters before the first character). This is why the I/O buffer in the Level II memory map shows 16870 (41E6H) as the start location of the buffer, while RAM locations 16551-16552 indicate 16872.

The Video Display

The branch to the video display driver is done exactly as the branch to the keyboard, except that the CALL entry point is 0033H. There is no found exit from ROM this time. Thus, the only way to modify the driver would be to alter the DCB driver

RAM location 16445 (403DH) holds the 64 characters per line/32 characters per line status. A 00H at this location means 64 char./line; 08H means 32 char./line. The video driver uses this byte to determine whether to single or doublespace PRINTed characters.

The BASIC Program

As most users know, Level II BASIC programs are compressed in RAM. This simply

```
10 CLS : CLEAR660
28 POKE 16551,2 : POKE16552,63 ' START THE I/O BUFFER
   DOWN THE VIDEO DISPLAY
PRINT CHR$(20):
INPUT "TYPE SOMETEING IN"; A$
       PRINT AS
      HOME CURSOR TO PREVENT SCROLLING,
AND INPUT STRING
48 IF LEFT$(A$,3)<>"END" THEN GOTO 38
ELSE POKE 1655
      1,232 : PORE 16552,65
    ' IF NORE EXPERIMENTATION
        CONTINUE.
                      OTNERWISE, RESTORE
    NORMAL I/G BUFP
      ER LOCATION.
NOTE THAT SINCE NORMAL VIDEO MENORY CAN NOT RETURN
        THE
    END-OP-BUFFER BOH CODE (IT APPEARS AS AN "
        "), BASIC USES
    A DEFAULT STRING LENGTH.
```

Program Listing 1. The above demonstrates I/O buffer operation by relocating the buffer into the video memory.

```
28 PORE 16551,2 : PORE16552,63 ' START I/O BUFFER 3/4
       DOWN THE VIDEO DISPLAY
36 INPUT "DEPRESS (ENTER) WHEN TAPE IS READY" ; AS :
      INPUT !- 1, A$ ' NAIT FOR OPERATOR-READY AND THEN
   CASSETTE DATA
48 PORE 16551,232 : PORE 16552,65 ' RESTORE NORMAL I/
     O BUFFER
```

Program Listing 2. The above can be used to partially recover "unreadable" cessette deta blocks.

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ing or you havegarinner geer as a ecreasism was over denly you break out 8 hyperspace and your monitor display a the Chilling sight of three Klingon Battle Crusers libeting on your en! Thee end shows glow in luminous green against the black word of space. Moments later you have the characteristic rasp bound of Klingon leser exeapons, and, as you exich, high energy beams come kning toward the Enterprise in succession from

have been hil! You neer the dismat sound of the damage control alorm as "DAMAGE TO WARF DRIVE" and "DAMAGE TO You have been hit! You neer the distinct sound of the damage control earm as "DAMAGE TO WARR DRIVE" and "DAMAGE TO WARR DRIVE" and "DAMAGE TO PARASES" hash an your screen. The Kingnon have stopped frong! The Enterprise in crippled but your best! weapon said fill elect. It was it? you have more 'you green or in the command for patients or patients as you select a frong vector from your screen before the two your part of the Kingon shape, you select a frong vector from your screen and earl earl in those you hear the buzz of your photon torpido as you see it streets a Kingon and it streets him dead center! As you watch, the Kingon Bartte Crussel dismined street, accompanied by a satisfying cracking sound.

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LOCATION

means that the statements, functions and operators are represented by a one-byte code. In addition, certain pointers are set up within each line.

Tables 1 and 2 respectively show the numeric and alphabetic order listings of the compression codes. Note that each ELSE statement has an unseen colon before it, TAB is actually TAB(, and " ' " is a normal ":REM" sequence followed by the special code 251 (FBH).

Each program line takes the following form: e two-byte binary line pointer which points to the first byte of the line pointer of the next progrem line, a twobyte binary line number, the program line itself, and a code zero to indicate the end of the line. After the last line in a program, two zero bytes ere placed where the next line's pointer would normally be. One zero byte is also placed before the first line's pointer. Among other things, this initializes data statements.

BASIC stores the names of the statements (those which you see in a LIST) in ROM locations 5712-6175 (1650H-181FH). There are no special terminator codes to separate one statement name from another in this lookup table. Rather bit 7 (the highest bit) is set to a 1 in the first character of each statement name. The statement names are in the numeric order

125	150- TRON	175-LPRINT	200- MEM	225- COS
126	151 - TROFF	176 DEF	201 INKEY\$	228- SIN
127	152- DEFSTR	177— POKE	202— THEN	227— TAN
128 ENO	153- DEFINT	178— PRINT	203 NOT	228- ATN
129 FOR	154— DEFSNG	179— CONT	204-STEP	229- PEEK
130- RESET	155- OEFDEL	160- LIST	206 +	230 CVI
131- SET	156- LINE	161- LLIST	206	231- CVS
132- CLS	157— EQIT	182- OELETE	207— ·	232- CVD
133 CMD	158- EAROR	183- AUTO	208 /	233— EOF
134— RANDOM	159- RESUME	164- CLEAR	209 †	234— LOC
135- NEXT	160— OUT	185- CLOAD	210- AND	235-LOF
136- QATA	161 — ON	186- CSAVE	211- OR	236- MKIS
137— INPUT	162-OPEN	167- NEW	212— >	237 - MKS\$
138- OIM	163— FIELD	186 TAB(213 =	238- MKD\$
139- READ	164- GET	189 TO	214— <	239—CINT
140- LET	155— PUT	190 FN	215 SGN	240— CSNG
 141 - GOTO	166-CLOSE	191 — USING	216 INT	241 CDBL
142- RUN	167— LOAO	192- VARPTR	217- ABS	242— FIX
143 IF	168- MERGE	193- USA	218- FRE	243- LEN
144- RESTORE	169- NAME	194 ERL	219 INP	244- STR\$
 145— GOSUE	170- KILL	195— ERA	220 POS	245 VAL
 148- RETURN	171- LSET	196- STRINGS	221- SQR	248 ASC
147 REM	172- RSET	197 - INSTR	222- RNO	247- CHR\$
148- STOP	173- SAVE	198- POINT	223— LOG	248- LEFT\$
 149 LSE	174- SYSTEM	199- TIMES	224- EXP	249- RIGHTS
				250- MID\$

Note that ELSE is formed by preceding code 149 by a code 58, an ordinary ASCII colon. An apostrophe-REMark is formed by piecing a code 251 after a normal ":REM" (code 58, code 147) sequence.

Table 1. Numeric-Order Listing of Statement Compression Codes

of the statements: ENO first, FOR second, etc.

In order to determine the execution address of each statement and function, BASIC normally uses two other lookup tables.

There are separate tables for statements and functions, end other codes have individual routines for comparison and JUMPing. The statement table resides at locations 6178-6297 (1822H-1899H) and covers statements END (code 1280, 80H) through NEW (code 187D, BBH). The two-

byte jump addresses are in the numeric order of the statements. The function table resides at locations 5640-5711 (1608H-164FH) and covers functions SGN (code 215D,D7H) through MIO\$ (code 250D, FAH). Again, two-byte addressed jumps are in the numeric order of the functions.

BASIC jumps directly to each erithmetic function and not to an Intermediate routine. Miscallaneous codes such as ".", and "(", and all statements and functions with codes between 187

and 215 each have a separate compare and JUMP routine, some of which can be seen in ROM locations 9394-9521 (24B2H-2531H). See Table 3.

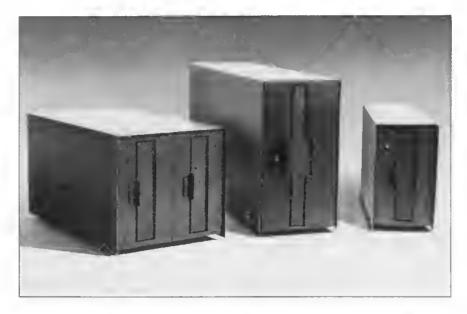
Variable Storage

In Level II, the simple variables, whether integer, single or double precision, are stored directly after the BASIC program in the order in which they are first used in a program. Arrays are stored after the simple variables, again in the order in which they are first used. Consult Table 4 for descriptions of the storage formats. Notice that the variable type codes equal the number of bytes in the variable efter the verlable name. This allows the type number to immediately tell BASIC how many bytes there ere to the next variable, thus speeding up slmple variable table searches. BA-SIC does not need to consult a lookup table to determine variable length. It can be fooled into believing that certain variables are not in the table, if a different value for the variable's length is POKEd into the variable-type byte. See Program Listing 3.

RAM locations 16641-16666 (4101H-411AH) store BASIC's type declarations (DEFINT, atc.). The table is in alphabetical order, with each byte indicating

æ	- 64	DEFSNO	-154	INT	-216	OPEN	— 162	STEP	-204
ABS	-217	DEFSTR	-152	KILL	-170	OR	-211	STOP	—148
AND	-210	DELETE	-182	LEFTS	-248	OUT	-160	STRING\$	— 196
ASC	-248	DIM	- 138	LEN	-243	PEEK	- 229	STRS	-244
ATN	228	EOIT	—157	LET	-140	POINT	—198	SYSTEM	—174
AUTO	-182	ELSE	-58, 149	LINE	-156	POKE	-177	TAB(— 186
COBL	-241	END	-128	LIST	-180	POS	-220	TAN	—227
CHRS	-247	EOF	-233	LLIST	-161	PRINT	—178	THEN	-202
CINT	-238	ERL	-194	LOAD	-167	PUT	-166	TIMES	-199
CLEAR	164	ERR	— 196	LOC	-234	RANDOM	-134	TO	-189
CLOAD	-185	ERROR	158	LOF	-235	READ	-139	TROFF	-151
CLOSE	168	EXP	-224	LOG	-223	REM	-147	TRON	— 150
CLS	-132	FIELO	-183	LPRINT	— 175	RESET	-130	USING	—191
CMD	-133	FIX	-242	LSET	-171	RESTORE	-144	USA	—193
CONT	—179	FN	-190	MEM	200	RESUME	— 159	VAL	-245
cos	- 225	FOR	— 129	MERGE	— 168	RETURN	-148	VARPTR	-192
CSAVE	—186	FRE	-216	MID\$	-250	AIGHT\$	-249		-207
CSNG	240	OET	-164	MKD\$	-238	AND	-222	+	-205
CVO	-232	oosue	-145	MKIS	-238	RSET	— 172	-	206
CVI	-230	COTO	-141	MKS\$	-237	AUN	-142	1	-208
CVS	- 231	IF	-143	NAME	— 169	SAVE	 173	<	-214
DATA	- 138	INKEYS	-201	NEW	-167	SET	— 131	=	-213
DEF	—178	INP	-219	NEXT	135	SGN	-215	>	-212
DEFORL	-155	INPUT	— 137	NOT	-203	SIN	-229	†	-209
DEFINT	-153	INSTR	—197	ON	161	SQR	-221		

Table 2. Alphabetic-Order Listing of Statement Compression Codes



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keyword	address	keyword	address	keyword	address	
END	7598D, 1DAEH	DUT	11003D, 2AF8H	INP	10991D, 2AEFH	
FOR	7329D, 1CA1H	ON	80440, 1F6CH	POS	10229D, 27F5H	
RESET	3120, 0138H	OPEN	18761D, 4178H	SQR	5095D, 13E7H	
SET	309O, 0135H	FIELD	167640, 417CH	RND	5321D, 14C9H	
CLS	4570, 01C9H	GET	18767O, 417FH	LOG	2057D, 0809H	
СМО	16755D, 4173H	PUT	18770D, 4182H	EXP	5177D, 1439H	
RANDOM	467D, 01D3H	CLOSE	16773D, 4185H	cas	5441D, 1541H	
NEXT	88860, 22B6H	LOAO	16778O, 4188H	SIN	5447D, 1547H	
DATA	7941D, 1F05H	MERGE	18779O, 4186H	TAN	5544D, 15A8H	
INPUT	8602D, 219AH	NAME	167820, 418EH	ATN	5565D, 158DH	
DIM	9736D, 2608H	KILL	16785D, 4191H	PEEK	11434D, 2CAAH	
READ	8687D, 21EFH	LSET	16791O, 4197H	CVI	18722D, 4152H	
LET	79690, 1F21H	RSET	16794O, 419AH	CVS	16728D, 4158H	
GOTO	76740, 1EC2H	SAVE	16800D, 41A0H	CVD	16734D, 415EH	
RUN	78430, 1EA3H	SYSTEM	690D, 0262H	EOF	18737D, 4161H	
1F	8249D, 2039H	LPRINT	8295O, 2067H	LOC	16740D, 4164H	
RESTORE	7569D, 1D91H	DEF	16731D, 4159H	LOF	18743D, 4187H	
GOSUB	7857D, 1E81H	POKE	114410, 2C61H	MKI\$	18746D, 416AH	
RETURN	79020, 1E0EH	PRINT	83030, 206FH	MKS\$	18749D, 416DH	
REM	79430, 1F07H	CONT	7652O, 10E4H	MKD\$	16752D, 41/0H	
STOP	75930, 1DA9H	LIST	110540, 262EH	CINT	2687D, 0A7FH	
ELSE	7943O, 1F07H	LLIST	110490, 2629H	CSHG	2737D, 0AB1H	
TRON	7871D, 1DF7H	DELETE	112050, 2BC6H	CDBL	2779D, 0AD6H	
TROFF	76720, 10F9H	AUTO	82000, 2008H	FIX	2854D, 0626H	
DEFSTR	7680D, 1E00H	CLEAR	7902O, 1E7AH	LEN	10755D, 2A03H	
DEFINT	7683D, 1E03H	CLOAD	112960, 2C1FH	STR\$	10294D, 2836H	
DEFSHG	7686D, 1E06H	CSAVE	112530, 28F5H	VAL	10949D, 2AC5H	
DEFDEL	7689D, 1E09H	NEW	6985D, 1B49H	ASC	10767D, 2A0FH	
LINE	16803O, 41A3H	SGN	24420, 098AH	CHRS	10783D, 2A1FH	
EOIT	11672D, 2E60H	INT	28710, 0B37H	LEFT\$	10849D, 2A81H	
ERROR	61800, 1FF4H	ABS	2423D, 0977H	PIGHT\$	10897D, 2A91H	
RESUME	8111D, 1FAFH	FRE	10196D, 27D4H	MID\$	10906D, 2A9AH	
STRING\$	10799D, 2A2FH	INSTR	16797D, 419DH	TIME\$	16758D, 4176H	
POINT	306D, 0132H	FN	16725D, 4155H	&	15788D, 4194H	

Table 3. Jump Addresses for Statements and Functions

the default variable type by the appropriate type code (2, 3, 4 or 8). At power-up, after a RUN, or after a CLEAR, all bytes in the table contain the code for single precision, 4.

Integer Humber

Limite of BASIC

When you enter a response to the "MEMORY SIZE?" question. BASIC stores the highest address that it is ellowed to use in (40B1H-40B2H), BASIC will never use any address above that which these two bytes point to. When ENTER is used as the "MEMORY SIZE?" response, BASIC uses all available memory. However, if a number is entered in response to the question, BASIC will only use memory up to that number minus two.

RAM locations 16561-16562

The CLEAR N statement affects locations 16544-16545 (40A0H-40A1H). These locations point to the highest memory byte to be used by BASIC for non-string purposes, not the lowest byte of the string storage erea. The pointer indicates the top of BASIC RAM byte (in 16561 -16562) minus N, N from the CLEAR N statement.

These two pointers can be manipulated to allow a program to reserve high RAM for a POKEd machine language program or byte oriented storage area without anything having been entered in response to "MEMORY SIZE?", This high RAM aree can be decreased in size at any time and expanded after any appropriate CLEAR or CLEAR N statement.

number) as it only the CLEAR N had been performed. Any subsequent CLEAR N's actually result in N bytes of string space and a corresponding amount of program RAM, BASIC would be acting normally, as it "MEMORY SIZE?" had been answered with a number. The top of BASIC RAM pointer can be raised (decreasing reserved memory) at any time with no ill effects. The top of BASIC RAM pointer can not be lowered if any strings are in the string storage area, however.

dura.

First, CLEAR enough memory to hold your strings and reserved memory. Then POKE the value (in two-byte binary) for the new top of RAM byte into locations 16561-16562. There are now (top of RAM) minus (top of BASIC RAM) reserved bytes and (top of BASIC RAM) minus (bottom of string RAM) number of bytes of string storage. Program 3 is an illustration of this proce-

After the initial CLEAR N and POKE's, there is the same amount of program RAM (MEM

Funny things happen when BASIC is told to operate on strings in an illegal area. Note that if no strings are yet assigned a value in a program, the top of BASIC RAM pointer can be positioned in relation to a numeric variable. Because the stack begins right below it, the bottom of string RAM pointer should never be manually (via POKE) changed.

RAM locations 16548-16549 (40A4H-40A5H) store the location from which BASIC begins storing a program. These locations do much more; they indicate the byte from which BASIC lists a program, scan lines for EDIT, and start a RUN. Useful manipulation of this pointer usually regulres manipulation of a few others (except for CLOAD and a couple other commands), so discussion of it will come after a discussion of those other pointers.

Variable Tables

When program variables are CLEARed, they are not really erased; specific pointers are re-

: byte 1-Identification code 02H byte 2-second character of variable name byte 3-first character of variable name byte 4-integer value LSB byte 5-integer value MS8 Single Prec. Number : byte 1-identification code 04H byte 2-second character of varietie name byte 3-first character of variable name byte 4-7-single precision value Double Prec. Number : byta 1—Identification code 08H byta 2-second character of variable name byte 3-first character of variable name byte 4-string length (0-255) byte 5-6-location of first character of string (LS0,MS0) Numeric or String Array; byte 1-appropriate identification code (2, 4, 8 or 3) byte 2-second character of variable name byte 3-first character of variable name byte 4-5-length of ectual erray (LOA) (LSB.MS6) byte 6-number of dimensions in array (1-255) bytes 5 + 2n - 6 + 2n-# of elements in dimension "n" (1st, 2nd, etc.)

bytes 7 + 2n - 5 + LOA-the erray elements

The characters of the variable names are stored as the corresponding ASCII codes. If the variable name is one-letter, the "second character" byte contains a 00H. The "length of actual srray" pointer indicates the number of bytes in the array which follow the pointer (# of bytes in the array after byte 5).

Table 4. Verieble Storage Formets

XOX DIT

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- 13) Copy with variable length files
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- 16) Boot without re-setting clock and date
- 17) Display current time and date from DOS
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- 19) New BACKUP (more reliable, no pack ID check)
- 20) New FORMAT (more reliable, no need to bulk erase disk first)

- 1) Single drive copy
- 2) Restore (dead files
- 3) Purge (unwanted files)
- 4) Clearfile (destroy data with zeros)

CITY _____

PHONE ___

5) Transfer (moves all files from one disk to another)

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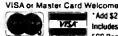
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BOX 3435 LONGWOOD THE

set so that the variables can no longer be accessed, BASIC forgets the variables, just as it forgets a program after a NEW. These four pointers control the length of a program, simple variables, array variables, and data statements.

RAM locations 16633-16634 (40F9H-40FAH) indicate the top of the simple variable table. which is physically the lowest byte in the table, since that is where BASIC begins a table search. These point to the first byte of the first variable in the table, not any of the three 00H bytes at the end of a BASIC program.

Locations 16635-16636 (40FBH-40FCH) indicate the top of the array table (the lowest byte of the table). Again, these point to the first byte of the first array, not the last byte of the last simple variable. Note that if there are no simple variables, this pointer equals the top of simple variable table pointer.

Locations 16637-16638 (40FDH-40FEH) indicate the next byte after the byte at the bottom of the array table (the highest byte of the table plus one). Note that if there are no arrays, this pointer equals the top of array table pointer.

Locations 16639-16640 (40FFH-4100H) indicate the current BASIC DATA pointer. This indicates the data delimiter (comma, etc.) just before the next piece of data to be read. If the next piece of data is at the beginning of a DATA statement, the pointer indicates the 00H carriage return at the end of the program line in which the latest

piece of data has been read (the 00H byte at the beginning of a BASIC program if no data has been read, or the colon after the latest DATA statement if there were other statements after that DATA statement within its program line). If the next piece of data is not right at the beginning of a particular data statement, the pointer indicates the comma preceding the piece of datanever a space (nor a semicolon, since that is not a data delimi-

If these bytes do not point to some proper delimiter, an "OUT OF DATA" error will occur, if the pointer indicates a comma in the middle of a non-DATA statement such as a PRINT statement, BASIC will treat the PRINT statement as a DATA statement and will thus read the program as data.

The first three pointers are quite sensitive, doing anything from making a RESET necessary to causing a new "MEMD-RY SIZE?" if they are improperly positioned. One must organize the first three pointers in a way that seems logical to BASIC. The following are a few ways to do this.

Level II does not have an ERASE statement, which allows a program to selectively CLEAR a particular array from memory, usually so that the freed memory can be used for some other array. For example, ERASE A would eliminate array A from the table. We can't have the versatility of erasing any single array we want to, but we can erase any array if we are willing to erase all arreys below it in the array table. This means that if

```
10 A=1:B=2:C=3:O=4 ' INITIALIZE VARIABLES
20 POKE VARPTR(B)-3 , 4+7 ' POKE AN EXTRA SKIPPING-OVE
    DISTANCE ( THE REST OF B AND ALL OF C ) INTO
   VARIABLE-TYPE BYTE
30 PRINT A, 8, C, O
30 PRINT A, 6, C, O ' PRINT THE RESULTS
40 POKE VARPTR(A) +4 , 4 ' THE ONLY W
                                ' THE ONLY WAY TO REVERSE THE
          SKIP-OVER ( B IS NO LONGER &, !, *, OR $ BECAUSE
      OF ITS
50 PRINT A,B,C,D ' PRINT THE RESULT
```

Program Listing 3. The above could be used when running multiple programs which share only a section of the variable table.

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10 GTO "ENTER A LINE" 20 REM LINE 10 IS THE SAME AS 'GOTO 30' 30 JNAME "ENTER A LINE": INPUT A\$

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program line! For example: A\$ = "PRINT X" : X = 4 : EXEC A\$ would result in a 4 printed on the screen (that is, execution of the BASIC statement "PRINT X"). With EXEC, your computer can write its own programs and execute them!

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5 CLS CLEAR PRINT PRESENT TOP OF BASIC RAM : "; PEER(16561)+PEER(16562)*256: PRINT PRESENT 60
TTON OP STRING STORAGE SPACE : "; PEER (165 44)+PEER(16545) *256: PRINT AMOUNT OF FREE STRIM G SPACE : ": PRE(AS) 11 ' CLEAR OLD STRINGS AND PRINT PRESENT POINTER CONDIT IONS
28 INPOT "NUMBER IN 'CLEAR N' STATEMENT";N: CLEAR N ' INPUT AND CLEAR DESIRED AMOUNT OF STRING STO RACE SPACE
34 INPUT "MEN TOP OF BASIC RAM ('MEMORY SIZE' + 2)"; NS: PORE 16562 , INT(NS/256) : PORE 16561 , AS-INT (MS/256)*256
' INPUT AND SET MEW TOP OF BASIC R 48 PRINT : GOTO IS ' PRINT OUT RESULTS AND RESTART EXP ERIMENT EXIT PROGRAM VIA (BREAK) KEY.

Specifications (Program 4)

• allows the programmer complete freedom to CLEAR string storage space, without losing any variables

note: CLEARed space, of course, must not overlap the variable area (not be too large), and must not be too small to handle present string variables, if they are desired intect. The programmer may selectively save only simple variables (if an array is to be re-DiMensioned), or may save both simple variables and array variables.

Usage

save pointers:

a, simple variables only: GOSUB 50300

b. simple variables and arrays: QOSUE 50360

a restore pointers:

a. simple variables only: GOSUE 50325

b. simple variables and arrays: GOSUB 50375

note: Read first Item under "Specifications" for caution during uee.

No new variables may be introduced (nor any old variables re-introduced after the CLEAR or CLEAR N) before the pointer-restore GOSUB is made!!!

 You may, however, use in any way your existing old variables before the CLEAR or CLEAR N is made.

Program Listing 4. The above illustrates bow to reserve high memory after the "MEMORY SIZE?" question has been answered

the order of array initialization is A, B, C, and array B is erased, both B and C will be erased. First, compute VARPTR (first element of array, such as B(0,0)) -6-2" (the number of dimensions, in this case, 2). The 6 represents the array identification bytes, and the 2" (number of dimensions) represents the number of elements in dimension words in the array header. In a 32K RAM or 48K RAM system, the VARPTR function will return a negative value if the array is in the above 16K RAM area, and you must convert it to the actual address by adding 65536 to it. Load this number (in two-byte binary format) into the bottom of array table pointer at locations 16637-16638. If you wish to erase all the arrays and keep the simple variebles, simply POKE the value of the top of array-table pointer into the bottom-of-erray-table pointer.

Simple variables can be erased by repositioning the topof-array-tebie pointer and setting the bottom-of-array-table pointer equal to the top-of-arraytable pointer, to maintain a valid array table thereby erasing any arreys.

Program Listing 4 demonstrates the method used to CLEAR string storage space without losing variables. The old variable table pointer values are stored in memory (POKEd into the first program line) and later restored to the pointers.

By manipulating the DATA pointer a program can use multiple independent data files. Let N be the number of filee and X be one of the files.

Program Listing 5 uses an N-2 BASIC array to store the

RESTORE X position and the current REENTER X position in the program's data. The RESTORE X position is set during an initialization GOSUB which tells the subroutine to scan for the beginning of the program line indicated by XP and store it in array element P(- CC,0). The REENTER X position is set to the RESTORE X position during initialization, and from then on is set to BASIC's current data pointer whenever the selected file is changed.

By manipulating several of the above pointers, the location in RAM from which BASIC begins to store a program can be changed. This involves moving the beginning of program pointer to a properly organized threebyte area in RAM and then positioning the variable table pointers to the appropriate RAM locations. A properly organized area

```
58368 **********************
50301 **
                   VARIABLE-POINTER SAVER SUBROUTINE -
58384 ****************************
58389
' SAVE SIMPLE VARIABLE POINTERS
58318 POREPEEK(16549)*256+PEEK(16548)+7, PEEK(16635):
         POKEPEER (16549) *256+PEER (16548) +8, PEER (16636)
58328 RETURN
         RESTORE SIMPLE VARIABLE POINTERS
58338 PORE16635, PEEK (PEEK (16549) *256+PEEK (16548)+7):
          POKE16636, PEEK (PEEK (16549) *256+PEEK (16548)+8)
59335 POKE16637, PEEK(16635):
POKE16638, PEEK(16636
58348 RETURN
58358 SAVI
         SAVE SIMPLE VARIABLE AND ARRAY POINTERS
59355 GOSUB59399
58368 POKEPEEK(16549) *256+PEEK(16548) +9, PEEK(16637):
          POREPEER (16549) *256+PEER (16548) +18, PEER (16638)
50370 RETURN
50375 RES
         RESTORE SIMPLE VARIABLE AND ARRAY POINTERS
50388 GOSU850325
58385 POKE16637, PEEK (PEEK (16549) *256+PEEK (16548)+9):
          POKE16638, PEEK (PEEK (16549) *256+PEEK (16548)+18)
58390 RETURN
                         Specifications
                          (Program 5)
```

- allows the programmer to usa multiple, independent DATA files within a program
- allows simple, fast switching between these files
- uses simple initialization procedures

Usage

- pointer Initialization for file X:
- a. Array P must be DiMensioned to at laast a P(X,1) size.
- b. X must be one or greater; file 0 is always initialized to start at the first line of a BASIC program.
- c. CC must indicate the value X (must be negative).
- d, XP must indicate the tine number where DATA file X begins; for line numbers greater than 32767, XP is not converted to "signed" format—for line number 40000, XP = 40000
- a. The program executes a GOSUB 50900.
- Note that the line-finding routina is written to conserve memory, not for speed.
- e restoring the DATA pointer to the beginning of file X:
- a. CC must be 0.
- b. XP must equal X.
- c. The program executes a GOSUB 50900.
- a reentry to the point in file X where READing left off;
- a. CC must be 1.
- b. XP must equal X
- c. The program axecutes a GOSUB 50900.
- Note that in lines 50900 and 50940, a sign conversion is made on the PEEK eddresses to allow operation on lines above the 16K RAM level-the " + 16636" (Z1>3278X)"'s can be deleted from the subroutine if no lines are above the 16K RAM level.

Program Listing 5. This subroutine, because of its neture, uses no BASIC variables. It does, however, require that the first program line in the program—line 0—be a REMark statement (REM immediately after the 0) with at least eight spaces after the REM. Line 0 is where the variable-table pointers are temporarily stored and later retrieved from by this subroutine.

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address(es)	addresa(es)	purpose			
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16390-16392	4006H-4008H	RST 18H jump vector			
16393-16395	4009H-4006H	RST 20H jump vector			
16396-19398	400CH-400EH	RST 28H jump vector; BREAK key jump vector			
16399-16401	400FH-4011H	RST 30H jump vector			
16402-16404	4012H-4014H	RST 38H jump vector; interrupt mode 1 (FDC, RTC) jump vector			
16438-16444	4036H-403CH	"old keyboard" image storage aree			
16445	403DH	video characters/line mode storage (0 = 64, 8 = 32)			
16526-16527	408EH-408FH	USR JUMP transfer address			
16537	4099H	most recent keyboard character			
18544-16545	40A0H-40A1H	bottom of string storage area RAM minus one			
16546-16547	40A2H-40A3H	current line number (line under execution)			
16548-16549	40A4H-40A5H	beginning of BASIC program			
16551-16552	40A7H-40A8H	I/O buffer start position			
16554-16556	40AAH-40ACH	seed for random number generator			
16561-16562	4001H-4082H	top of BASIC-usable RAM ("MEMORY SIZE?" minus two)			
16598-16599	40D6H-40D7H	lowest byte of the lowest string in the string area—1			
16600-16601	40D8H-40D9H	location of where BASIC is currently reading a program			
16614-16815	40E6H-40E7H	location of current statement under execution			
16616-16617	40E8H-40E9H	current lowest location of BASIC's stack			
16520-16621	40ECH-40EDH	"." Ilne number			
16633-16634	40F9H-40FAH	top of simple variable table			
16635-16636	40F6H-40FCH	top of array table			
16637-16638	40FDH-40FEH	bottom of array table plus one			
16639-16640	40FFH-4100H	current location of BASIC's DATA pointer			
16641~16666	4101H-411AH	variable-type definition table			
16722-16805	4152H-41A5H	JUMPs to DISK BASIC routines			

Table 5. Numeric-Order Listing of RAM Areas

of RAM is one which makes BA-SIC think that the beginning of program pointer actually is at the beginning of any program, or the end of a program. In each case, the beginning of program pointer would indicate the first byte of the appropriate program line's line pointer. The simplest way to position the variable table pointers is to execute a NEW or CLOAD after positioning the program pointer.

The variable table can be repositioned anywhere in memory. One need only change each of the variable table pointers so that the simple variable teble starts at the chosen position and all other pointers are in proper relation to each other. The top array table pointer, for instance, must indicate the next byte after the last simple variable. A possible use of this is to set up a low memory byte-oriented storage area (i.e. between program and simple variables). No program lines can be added, deleted, or EDITed if the variable table is in memory lower than the program. This would cause a non-RESETable computer

The program may be changed in any way if the variable table is above the program. BASIC will not change the position of the table unless enough lines are entered so that the end of the program is beyond the start of the table. From that time on, the table will be at the true end of the program.

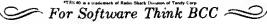
This ability, along with an extension of Program 4 to include the top of simple variable table pointer, would allow editing of a program without damage to the variable table.

Multiple programs can reside independently in the computer's memory at the same time. They may have the same line numbers and the same or different variable tables. Each program could call the others with some POKE statements and a GOTO statement (POKE a new beginning-of-program pointer and GOTO the desired line in the other program).



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58981 '* -- DATA STATEMENT SELECTOR --58984 '*********************************** 30989 ' 5K91# ONSGN(CC)+1GOTO5#95#.5#96K 5K92K 21=PEEK(16549) *256+PEEK(16548):P(8,8)=Z1-1:P(8,1) 58938 ZT=PEEK(Z1+3+65536*(Z1>32764))*256+ PEEK (21+2+65536*(21>32765)) 58948 IF2T=XPTHENP(-CC,8)=21-1:P(-CC,1)=21-1:RETURN ELSEZ1=PEER(Z1+1+65536*(Z1>32766))*256 +PEEK(Z1+65536*(Z1>32767)): IFZ1>STBENG OTO5893BELSEERRORS 58958 P(XP,1)=P(KP,8):IFXP=DPTHENGOTO58965 5896E P(DP,1)=PREX(1664B)*256+PREK(16639) 58965 POREL664B,P(XP,1)/256: POREL6639,P(KP,1)=IN T(P(XP,1)/236)*256: OP=XP:RETURN Variable List Variable **Purpose** Pointer(X,F) Pointers for each program DATA file X; Function 0 = restore to file X, Function 1 = reenter file X **XParameter** operation Parameter: during initialization, indicates line number where file starts; during restore or reenter functions, Indicates the file number itself **ConditionCode** operation-type Indicator **Data Pointar** indicates most recent file under use pointer to beginning of currently examined line ZΤ line number of currently examined line

Program Listing 6.

Run-Time Pointers

Three run-time pointers heve soma effect on error handling, STOP, and "." line update. RAM locations 16600-16601 (40D8H-40D9H) stora the current position of exactly where BASIC is reading from a program. This includes command mode operation (from I/O buffer), Locations 16614-16615 (40E6H-40E7H) stora the location of the beginning of the current statement under execution. This indicates either a colon for a statement in the middle of a line or the 00H carrlage return of the preceding line for e statement at the beginning of a line. This pointer also operates in the command mode. The current line number is stored at locations 16546-16547 (40A2H-40A3H). This is an FFFFH for command moda.

POKEing the first two of these pointers has no visible affect on program execution because they are continually updated. POKEing an incorrect line num-

ber into the current line indicator will cause an incorrect ERL and "." line if an error occurs in the same line as the POKE.

The "." line number is stored in locations 16620-16621 (40ECH-40EDH). This is an FFFFH if there is no valid "."

Locations 16598-16599 (40D6H-40D7H) point to the location just below the lowest location of any string in the string storage area. This is used to assign storage positions of strings assigned a new value so that no old strings are overwritten and so that the stack is not destroyed. Note that FRE(A\$) is not determined by this pointer.

Locations 16616-16617 (40E8H-40E9H) appear to point to the present lowest location of the stack pointer that is used for FOR-NEXT, GOSUB, etc.

The RND(X) seed number is stored at locations 16554-16556 (40AAH-40ACH). At power-up, all three bytes are FFH or 00H. ■

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Avoid

the vagueness of line numbers; use mnemonics for BASIC function calls.

Now it's Time for... Name That Routine

David Cornell 335 Parkside Rd. Harrington Park, NJ 07640

PASIC is convenient, easy to learn and presents few problems when programs are small. However, as programs become large, some structural features are capable of driving one berserk. At the top of this list are line numbers.

The problem is that line numbers, while helpful in editing, give no indication of the line's function. "GOSUB 1000" can be anything. Line 47306 can be anything. Renumber the program and it's something alse. Trying to understand or debug published programs is particularly maddening. One is constantly confronted by statements such as:

100 ON X GOSUE 1000, 2000, 3000, 40600

all of which can be anything.

A better system assigns a mnemonic, or label, to a routine which describes its function. The above example might then look something like this:

100 ON X GOSUB ADD ENTRY, FIND ENTRY, CHANGE ENTRY, DELETE ENTRY

Commands and Syntax

The program offered here, called Label, ellows statements

to be entered just this way. In the above example, "ADD ENTRY", "FIND ENTRY", etc. are names, or "labels" for routines. The label describes the function of the routine and makes it easier to both write the program, and to understand how the program functions when reading the listing.

BASIC programs created using Label will run as written, or may be used as source programs to create "object" programs in standard TRS-80 BASIC.

The commands and syntax of Label evolved from what I then considered standard BASIC programming procedures. While writing BASIC programs, I had made separate, handwritten lists of where routines were located. If a routine was to be called, its line number was looked up. If something crashed in the sort routine, its line number was looked up again, so that the routine could be found and edited. When a program was renumbered to make room for additional lines, routines had to found ell over again, and a new list made.

All this was a minor inconvenience with small programs. However, programs do tend to grow (and grow and grow...). The result usually was a combination of scratch paper and aggravation, especially when I reminded myself that buying a computer was supposed to put

an end to paperwork!

REM statements helped, of course; I began to include a REM which identified a routine. A sort routine, for example, at line 100 might be preceded by:

95 REM * SORT

The asterlsk (*) was easier to spot as it zipped by on screen. But such a method was ell the more annoying because keeping track of routine locations is the sort of thing that a computer can do better.

For me, the annoyance got to be too much.

I begen to write a machine lenguage program that searched the BASIC program for lines beginning with "REM*", compared strings, with a GOTO the following line if a match was found. Then I added GOSUB to the list of possibilities. Later the REM was dropped. Then I added ON, and so forth.

Now, with Label, I can call a sort routine by entering GOSUB SORT in the BASIC program. To find out where the sort routine is located, just enter FIND SORT. It's a big Improvement. Label fits into low memory, thus evoiding conflict with most other machine language routines. The initialization routines then move the BASIC program above Label. This can create some problems with software that essumes BASIC will elwaye start at the same address.

In Program Listing 1, Label is

assembled at 17129, low memory on a non-disk TRS-80 system. It can, of course, be assembled to tit anywhere. The complete version, available from Instant Software, Peterborough, NH, includes a loader that calculates the lowest available memory, resolves all specific memory references, and loads the program down. All this makes Label memory independent.

Teking Control from BASIC

If TRS-80 BASIC were in RAM, this whole thing would be a lot simpler and a lot shorter. Fortunately, at various points, BASIC does make calls to reserved RAM locations. By substituting a JUMP or CALL, control can be taken from BASIC. To do this, a JUMP command is simply exchanged with the original BASIC command, saving that original command for later execution.

Label makes use of two RAM locations in this menner. In the command mode, Label examines each entry, substituting a token for each reserved word it finds. Before execution, however, a CALL is made to RAM at location 41B2. At this point a check can be made for commands recognized by Label or any user program. In fact, any number of programs can be connected, control passing from one to the other, and returning to BASIC if nothing is recognized.

At run time, and before each

line is interpreted by BASIC, a keyboard scan routine is called to check for BREAK or SHIFT@. This routine has a RAM call to 41C4. If the return address is the line interpreter in ROM, 1D21, control is taken from the normal BASIC process by substituting a return address in the stack.

Examples are usually more helpful than explenations. Table 1 shows a group of routines that might be used as the starting point for an address book program (possibly poorly conceived, in this case). This side-by-side comparison of the "source" and "object" programs should help clarify Label's main reason for existence.

Note that as long es Label is in place, the source program will run as written, but that the use of labels in place of line numbers makes the function of the program end the routines obvious.

Using Label

Label can also be used as a kind of operating system. It is composed of small, callable routines that combine to form blocks of functions. These in turn combine to form larger blocks. Beceuse these routines are not sequential and may be accessed at random by a machine language CALL, they can easily be incorporated into other programs or routines.

As an example, Label uses an asterisk (*) to identify BASIC lines with target labels. You may wish to write e program similar to Label that uses "%" to identify lines, or you may need to tind a line that begins with a specified character. The routines in Label are available for that purpose. Consulting the listing, you will see that the routine that searches the BASIC program for a target label is called FNDKEY.

Each line of Progrem Liating 1 explains its own function. Exemining the listing will show you how to use the Z-80 registers on entry to a routine, and what values will be returned. Table 2 defines all of Label's routines.

Syntax

An * at the start of a line identifies a label. The character string following the * is the name (i.e., label) of the routine that begins on the following line of the program.

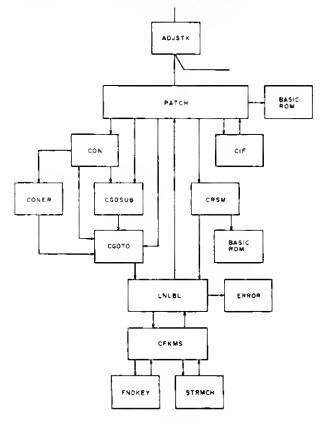


Figure 1

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50 ' MENU 80 INPUT "CMO";CS 100 GOSUB PUT IN ARRAY 110 GOTO MENU 500 * PUT IN ARRAY 510 N = N + 1 520 A(N) = X 530 RETURN

MENU is the name of the routine beginning at line 60; likewise, PUT IN ARRAY is the label for the routine beginning at line 510.

After entaring BASIC (the command word, not the language), Label repleces all labels which are the object of GOTO, GOSUB, etc., with line numbers. For example:

BASIC (enter) 50 " MENU 60 INPUT "CMD":C\$ 100 GOSUB 510 110 GOTO 60 500 * PUT IN ARRAY 510 N=N+1

The command BASIC has two additional "switches," DELETE and REM. By entering BASIC DELETE, lines 50 and 500 (the lines with the label identifier *) are deleted.

Entering BASIC REM changes lines 50 and 500 to REM statements. The command DELETE LINE REM deletes all lines which begin with REM.

The command LIST ROUT lists all label lines, identifying all your routines:

LIST ROUT (enter) 50 * MENU 500 * PUT IN ARRAY READY

If labels are present in IF-THEN-ELSE statements, the commands GOTO and GOSUB must be used:

100 IF X = 1 GOTO PUT IN ARRAY ELSE **GOTO GET FROM ARRAY** 200 IF X = 2 THEN GOTO INPUT **ADDRESS**

The line: 100 IF X=1 THEN PUT IN ARRAY will not work. Numbers end labels can be mixed as in the following line.

950 ON X GOSUE DEC/FRAC, 200. **OISPLAY RESULT**

While Label is operating, all lines beginning with the label identifier will be treated as REM stetements, meaning they will be ignored by the BASIC proarem.

A valid label is any character string which does not begin with a number or delimiter. The delimitars are the colon, the comme or a zero byte (not ASCII 0). Delimiters indicate the and of the label and, obviously, may not be used as part of the label.

Labels cen be any length consistent with BASIC (255 characters maximum), thus permitting dateiled descriptive names to be used in your program develop-

Source Program Will Run as Writtan

10 REM THIS IS A DEMO FOR LABEL 100 CLS 110 * MENU 120 PRINT "1, NEW ENTRY" 130 PRINT "2. LIST ENTRIES" 140 PRINT 150 INPUT X: CLS 160 ON X GOSUB NEW ENTRY, LIST ENTRIES 170 GOTO MENU 160 * NEW ENTRY 190 GOSUB INPUT NAME 200 GOSUB INPUT ADDRESS 210 GOSUB APPROVE ENTRY IF X\$ ="Y" GOSUB PUT IN ARRAY 220 230 RETURN 240 'LIST ENTRIES 250 GOSUB HEADING 260 FOR F = 1 TO FN 270 GOSUB PRINT ENTRY 260 NEXT 290 RETURN 300 * INPUT NAME 310 INPUT "NAME ";NA\$ 320 RETURN 330 * INPUT ADDRESS 340 INPUT "ACCRESS ";AD\$ 350 RETURN 360 * PUT IN ARRAY 370 EN = EN+1 B\$(EN,0) = NA\$; 360 B\$(EN,1) = AD\$ 390 RETURN 400 ' HEADING 410 PRINT "NAME", "ADDRESS" **420 RETURN** 430 * PRINT ENTRY 440 NAS = BS(E,O): PRINT NAS, 450 AOS = BS(E,1): PRINT ADS **460 RETURN** 470 · APPROVE ENTRY 480 CLS 490 GOSUB HEADING 500 PRINT: PRINT NAS, ADS 510 * APPROVE 520 PRINT:PRINT 530 * APPROVE 1 540 PRINT"IS THIS CORRECT Y/N" 550 X\$ ≃ INKEY\$: IF X\$ = ""THEN560 560 IF (X\$ = "Y" OR X\$ = "N") RETURN **ELSE GOTO APPROVE1**

Aftar Command **Basic Rem**

10 REM THIS IS A DEMO FOR LABEL 100 CLS 110 REM MENU 120 PRINT "1, NEW ENTRY" 130 PRINT "2. LIST ENTRYS" 140 PRINT INPUT X: CLS 180 ON X GOSUE 180,250 170 GOTO 120 180 REM NEW ENTRY 190 GOSUE 310 200 GOSUB 340 210 GOSU6 480 220 IF X\$ = "Y" GOSUB 370 230 RETURN 240 REM LIST ENTRYS 250 GOSU8 410 260 FOR E = 1 TO EN 270 GOSUB 440 NEXT 260 290 RETURN 300 REM INPUT NAME 310 INPUT "NAME ";NA\$ 320 RETURN 330 REM INPUT ADDRESS 340 INPUT "ADDRESS ":AD\$ 350 RETURN 360 REM PUT IN ARRAY 370 EN = EN + 1 B\$(EN,0) = NA\$: 360 0\$(EN,1) = AU\$ 390 RETURN 400 REM HEADING 410 PRINT "NAME", "ADDRESS" 420 RETURN 430 REM PRINT ENTRY 440 NAS = BS(E.O): PRINT NAS, 450 AD\$ = B\$(E,1): PRINT AD\$ **460 RETURN** 470 REM APPROVE ENTRY 480 CLS 490 GOSU8 410 500 PRINT: PRINT NAS, ADS 510 REM APPROVE 520 PRINT: PRINT 530 REM APPROVE 1 540 PRINT"IS THIS CORRECT YIN" XS = INKEYS: 560 IF X\$ = ""THEN560

IF (X\$ = "Y" OR X\$ = "N") RETURN

ELSE GOTO 540

560

570 END

After Command

Basic Delete 10 REM THIS IS A GEMO FOR LABEL 100 CLS 120 PRINT "1, NEW ENTRY" 130 PRINT "2. LIST ENTRYS" 140 PRINT INPUT X: CLS 150 160 ON X GOSUB 190,250 170 GOTO 120 190 GOSUB 310 200 GOSUB 340 210 GOSUB 480 220 IF X\$ = "Y" GOSUE 370 230 RETURN 250 GOSU6 410 260 FOR E = 1 TO EN 270 GOSUB 440 280 NEXT 290 RETURN 310 INPUT "NAME ";NA\$ 320 RETURN 340 INPUT "ACCRESS ";AD\$ 350 RETURN 370 EN = EN + 1 BS(EN.D) = NAS: 360 6\$(EN,1) = AD\$ 390 RETURN 410 PRINT "NAME", "AQQRESS" **420 RETURN** 440 NA\$ = B\$(E,0): PRINT NA\$, 450 AD\$ = B\$(E,1): PRINT AD\$ 480 RETURN 480 CLS 490 GOSUB 410 500 PRINT: PRINT NAS, ADS 520 PRINT: PRINT 540 PRINT"IS THIS CORRECT Y/N" 560 XS = INKEYS: 1F X\$ = ""THEN550 560 IF (X\$ = "Y" OR X\$ = "N") RETURN **ELSE GOTO 540** 570 END

Table 1

570 END

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ment. In its string matching routines, Labei makes a byte-forbyte comparison, although it ignores embedded spaces.

Reserved words may be used as labels as long as the syntax is not recognized by the BASIC interpreter. For example,

100 GOTO NEXT 200 GOSUB RESUME

searches for a routine named NEXT, However, the BASIC language takes precedence in the following:

100 RESUME NEXT

This would execute as normal BASIC Instead of searching for e routine called NEXT.

Remarks may follow the com-

ma or colon delimiters in Label lines. For example:

500 * SORT:THIS ROUTINE SORTS

This has an advantage over REM statements on other lines since the Label command LIST ROUT will display both the label and the message for each routine, and LLIST ROUT will forward the information to a line printer.

Labeled routines may be accessed from the command mode. However the first command must be one recognized by standard TRS-80 BASIC. This may merely be a colon (:).

Examples: :GOTO MENU (enter) X = 1: GOTO MENU (enter)

Replaces part of BASIC ROM beginning at 1D1E **Function**

Checks for commands which may take a label and jumps

to appropriate routine

II BASIC line begins with an asterisk, process as a REM

statement

On Entry: On Entry and Exit to Special Case

Check:

On Exit

A = result of keyboard scan

A = BASIC Token - 80H HL points to token In BASIC line

ADJSTK (ADJust STack)

Function: Change return address to take control from BASIC On Entry:

Top of stack is first return address

Next two-byte word in stack is ultimate return and is

return address to be checked.

CHECK

Checks BASIC program for commands which may take a Function

label

Calls appropriate processing routine

Writes number for labels

FNOKEY (FIND KEY)

Searches BASIC program for lines beginning with search Function:

key

On Entry: Search key in register C

QE points to line where search is to begin. A = 0 if the end of the program was reached

IX points to the line with the label identifier and object

lahei

HL points to the address of the object key.

DE points to the next line, the object routine.

C = Search key

MCHSTR (MatCH STRInge)

Function: Compares two strings byte for byte, ignoring imbedded spaces until one of three delimiters, colon, comma on

zero is reached

On Entry The address of the source string is in the two bytes of

memory reserved by Label for the purpose: SRLBPT (SouRce LaBel PoinTer).

OE points to the object string.

On Exit: Carry set if match is found

PRCSGG (ProCaSs Goto/Gosub)

Change labels to line numbers in BASIC program Function. On Entry HL points to byte before first character of label or line

number

On Exit: HL points to next byte to be checked (by CHECK) for

GOTO, GOSUE, etc.

PRCSON (PRoCeSa ON)

As PRCSGG but must point to each label or line number Function:

in succession until end of line is reached.

CGOSUB (Command GOSUB) CON (Command ON) CGOTO (Command GOTO) CRSM (Command ReSuMe)

Function: Jump to Label if required

On Entry: HL points to command token in BASIC line.

HL points to first character source label or line number On Exit:

(not applicable for all cases of RESUME).

Function: Move part of BASIC program in RAM to allow a line

number to be written in place of a tabel The address of the source label is in SRLOPT

On Entry

The length of the string to be written in the BASIC program (the ASCII representation of the line number) in

LENDEC (LENgth DECimal number)

Program is adjusted. Carry set if new line pointers must

be written.

LINEIN

Function: LB FBBOB check

On Exit:

Entered if BASIC program line entered

BASIC line in input buffer On Entry:

Line number in DE

Note: If match is found and line numbers are the same, tine was being edited.

LENSTR (LENgth STRing)

Function: Count length of a character string to delimiter

On Entry: HL points to string. On Exit: B = Length of string

(BedMuL) 89ML

Function: To jump to routine corresponding to Label Command.

On Entry Register C equals the number of the word in the WORD

LIST matching entry in input buffer. Zero if there is no

match

To specified routine On Exit:

JMPTBL (JuMPTaBLe)

Function: Holds location of routines corresponding to words in

WROLST (Word List)

WADLST (WORDLIST)

Holds list of commands recognized by Label (The list Function:

looks a little weird because some of the words hold imbedded BASIC tokens. Thus, the word ROUT is indicated

by ASCII R followed by the token for OUT.)

WORD LIST Structure:

Function:

On Exit:

00 Begin List W

0 R

D 00

End Word **8ST 10H**

Label uses two RST's (Restarts) in BASIC ROM.

The RST's are calls: RST 18H is equivalent to CALL 18H.

Function: Next byte to A; Spaces are ignored. On Entry:

HL points to previous byte. On Exit: HL points to byte.

Byte in A

Z is set if (HL) is end of statement - comma, zero or col-

C is set it (HL) is a number. **8ST 18H**

Compare HL and DE

Z set if equal C set if HL+DE HL and DE unchanged

Table 2. Assembler Mnemonics, Names and Functions of Label Routines

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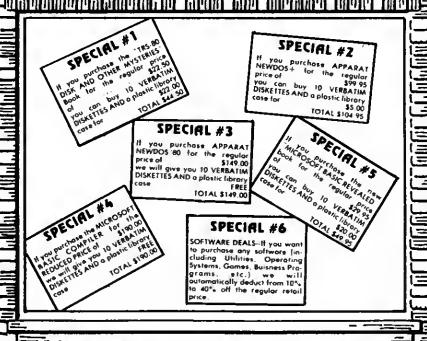
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This will not work: GOTO MENU (enter)

Three Function Blocks

Label may be considered to consist of three main function blocks: The Initialization Block (Fig. 1), which sets up the jumps and exchanges with BASIC RAM; the Run Time Block (Fig.

2), and the Label to BASIC Block (Fig. 3).

The Run Time Block consists of those routines needed when the BASIC program is running. It is further divided into three main sub-blocks which take control from normal BASIC, check for commands that mey take a label, and process those com-

Run Time Block Commands

LIST BOUT LUST BOUT LISTs all routine lines with the label identifier

Prints all lines with the label identifier FIND XXX

Finds and displays the line and label for routine named

XXX

DELETE LINE REM Deletes REM lines

Label to BASIC Block Commands

Converts to standard BASIC. Changes label to line

number following GOTO, GOSUS, etc.

CASIC DELETE Command BASIC and defetes all lines that begin with the

label identifier. BASIC REM

Command BASIC and converts lines with the label iden-

titler to REM statements.

Note: A comparison is made only for the length of the command, so that LIST ROUTINES produces the same result as LIST ROUT. The longer commands may be easier to remember

Table 3. Run Time Block Commands and Label to BASIC Commands

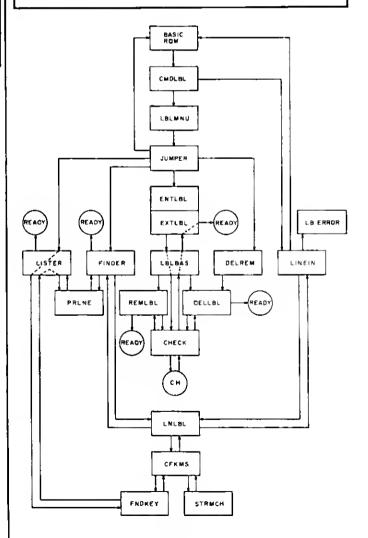


Figure 2

mands.

When a GOTO, GOSUB, or similer BASIC branching command is encountered, the next character is examined, if a number is found, a jump is made back into BASIC ROM, where

the program continues normally. If a number is not found, the Label program essumes that a labal has been used, and the command is processed by the eppropriete Label routine.

The Label to BASIC Block Is

```
40A4
           Points to start of EASIC program
   40A2
           Saves line number
   40A7
           Pointer to BASIC input buffer
          Pointer to start of variable table (scalar pointer)
   40F9
   40EB
           Saves HL
   40FQ
           Address of routine to be called on error
   101E
          Start line interpreter
   1D98
           Scan for SHIFT @ and BREAK
   0350
           Calls keyboard scan routine
   1AFC
          Writes line pointers beginning with line pointed to by OE
   1AFB
          Writes line pointers from beginning of BASIC program
   1A19
           Ready routine
   1997
           SN ERROR routine
   19A2
           ERROR routina
   164A
           NEW routine
          BASIC Initialization routines (RUN)
   1B50
  032A
          Display register A
  DEAF
          Oispley number in HL
          Check for enough RAM for stack operation
   196C
  287E
          Write line of BASIC In buffer, change tokens to words
  2875
          Display a string from (HL) until (HL) = 0
   4182
           First RAM called after immediate mode entry
   41C4
          RAM called by keyscan routine 0358
   4003
          Saves length ASCII representation of binary integer
   40D4
          Points to buffer where ASCII decimal representation written
Table 4. BASIC RAM and ROM Locations Used by Label
```

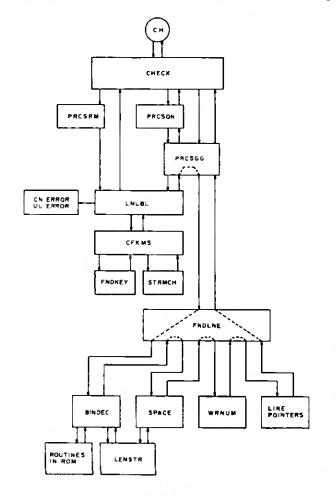


Figure 3

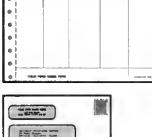
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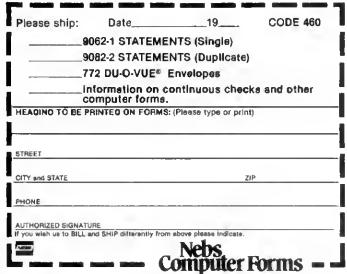
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called when there is a keyboard input in the command mode. If a line of a BASIC program is being entered, and that line contains an asterisk identifying a label, the BASIC program is checked to see if that label has already been assigned to a routine.

Should you attempt to use a label that is already being used in the BASIC program, then the error message ERROR, LABEL ASSIGNED will be displayed. Author's comment: For once the preferred version is shorter!

If a BASIC program line is not being entered at the command level, then a check is made to see if the input is a command recognized by Label. If that is the case, a jump is made to an appropriate processing routine within Label. If the command is not recognized, then control passes on to BASIC.

The principal function of this block is to convert the source program written with labels to a standard BASIC program. The BASIC program is searched for labels; the length of the program lines is adjusted to accommodate numbers in place of labels. The numbers are calculated and written into the lines, and the various user options are executed.

Label is concerned with the

commands GOTO, GOSUB, ON, ON ERROR, RESUME and IF. With the exception of IF, these commends are ell verlants of GOTO; RESUME is a special case of GOTO.

In both the Run Time Block and the Lebel to BASIC Block, then, the processing routines for these four related commands end up at the Lebel routine that processes the GOTO command. This centralization, in eddition to making the program easier to understand, makes modification much simpler.

Table 3 explains the commands for the Run Time Block and the Label to BASIC Block. Table 4 gives the RAM and ROM locations used by Label.

User Option

Three zero bytes (indicated by NOPs) are designated USROPT (for user option) in the assembly listing. These are provided so that the user's own machine language routines can be patched in, via CALL or JP, without affecting Label.

On entry to USROPT, the new BASIC line has just been entered, and the keyboard has been scanned for BREAK or SHIFT@. USROPT is at Label ORG + 38 hex or 56 decimal. ■

			Program Listi	ng 1
	00001 ;****	******	*********	**
	00051 :* I	ABSL - FC	88-3RT 3RT R	•
	88852 ;****	*****	**********	n##
	89053			
4289	88108	ORG	42898	
1A19	98158 BREADY	EQU	Belai	ADD.READY ROUTINE IN SOM
19A2	89288 ERROR	EQD	19A2E	ADD. ERROS ROUTINE IN SOM
888D	89250 GTOTOR	EQD	808	J GOTO TOKEN
0091	00300 GESTOR		91B	GOSUB TOKEN
00Al	88358 ONTOK	≅ OU	BAIS	ON TOKEN
4834	09400 APRPTE		49A4H	; BASIC PROGRAM POINTER
184D	00450 NEN	EQU	184DB	ADD.HEN ROUTINE IN ROM
40 A 2	00500 LNNBUF		40A2B	LINE HUMBER BUFFER
40 A 7	00550 AUFPTR		48A7B	POINTER TO INFUT AUFFER
1997	00600 SHERR	EQD	1997B	SN ERROR ROUTINE IN ROM
41C4	00650 BLNRAM		41C4H	CALLED AT SEG. OF EACH LINE
898F	99799 IFTOK	EQU	858	; IF TOREN
8600	00750 ERRTO!		89 Ea	ERROR TOKEN
0093	88888 RENTO		093a	REN TOKEN
1AF8	00850 FWRDP7		1858H	ROUT.WRITES LINE POINTERS
1850	00960 BASIH		1850H	; IHITIALIZATION ROUTINE
4003	00950 LENDEC		4003N	SAVES LENGTH DECIMAL 4
40D4	61666 DECPTS		4004R	POINTER TO DECIMAL NUMBER
40F9	01050 SCLNP		40F98	POINTER TO START OF SCALARS (VARIABLES)
009C	91199 LNETO		09 CB	; LINE TOKEN
00a6	01150 DELTO		086B	; DELETE TOKEN
0084	81200 LSTTO		0848	LIST TOKEN
00a5	01250 LLSTO	-	0a5R	; LLIST TOKEN
0000	01300 OUTTO		OAOH	OUT TOKEN
809F	01350 RSMTO		3£R	1 RESUNE TOKEN
8987	81488 NXTTO		87H	HEXT TOKEN
4182	01450 FSTRAN		4182N	FIRST RAM CALLED AFTER USER INPUT
1ED9	01500 ULERR	EQU	1ED98	JUL ERROR SOUTINE
99CF	01550 LBION		9CF8 . DICE	; LABEL IDENTIFIER
28 A7	01650	L EQD	28A78 ;DISP	LAY STRING UNTIL BYTE-8
		W CHACO.	CHANCES DESIGN	ADDRESS TO TAKE CONTROL FROM BASIC
				STACK IS ADDRESS IN QUESTION
42E9 D9	01800 ADJSTI		- GITC ROLL IN	SAVE REG'S
42EA C1	01850	POF	вс	,
42E8 D1	81988	POP	DE	
42EC 21211D	Ø195Ø	LD	HL,1021H	; ADD.LINE INTERP.
42EF DF	02900	RST	188	;RET,ADD,LINE INTERP?
4289 2003	02050	JR	NZ, KPSTK	; NO, KEEP STACK AS IS
42F2 11FE42	92198	ro nv	DE, PATCE	YES, CNANGE RET.ADD.
42F5 D5	02150 KPSTK	PUSH	DE	RESTORE RETURN ADD.
42F6 C5	02200 KG 31K	PUSE	BC	RESTORE SETURN ADD.
42F7 D9	02250	EXX		RESTORE REG'S
42F8 C3E942	02300 EXBLN	75	ADJSTK	; EKCHANGED WITH RAN DUBING INIT
.212 034742	02350 GROOM	•		provestant representative and
4288 CD5883	82488 A1DIE	CALL	03588	KEY BOARD SCAN
TELM COUPES	02450		22204	,
		N: REPLAC	ES PART DE SAST	C SEGINNING AT IDLE
			LT OF KEYBOARD	
4258 87	92699 PATCH	RO RO	A KDIDGIND	; REY AOARD INSUT?
42FF CAABID	02650	CALL	NZ,10ABH	YES
4302 22E649	92700	LD	(40E68), HL	18AVE NL Program contin

*** A PERCOM BULLETIN ***

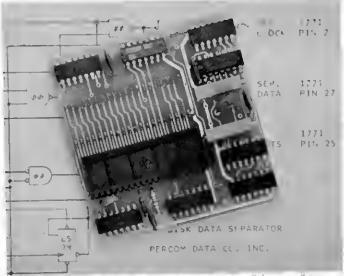
Adapter for TRS-80* computer eliminates disk read errors

Garland, Texas - Harold Mauch, president of Percom Data Company, announced that the company is marketing a simple plug-in adapter for TRS-80° computers that corrects a design deficiency in the disk controller circuit.

The problem, which causes disk read errors, has been traced to Tandy's reliance on a circuit internal to the FD1771 controller IC to perform the function of separating clock and data pulses.

As explained in the Backgrounder, use of the in-ternal chip circuit for reliable data-clock separation is a design shortcut which the manufacturer of the controller IC warns against.

The Percom solution, a PC card adapter called the SEPARATOR™, eliminates the problem by substituting an explicit data separator circuit



Percom adapter fixes TRS-80° computer disk controller.

one which has been used reliably in Percom disk controllers since 1977 - for the internal IC separator circuit.

The SEPARATOR™ is installed without modifying the host system. The user merely removes the FD1771 IC from the host controller, installs the IC in the DIP socket on the SEPARATOR™ card, and plugs the adapter into the vacated socket of the host con-

Percom cautions that opening the Expansion Interface of the TRS-80° computer, which is required to install the SEPARATOR™, may void the computer's limited 90-day warranty.

SEPARATOR'M The which sells for \$29.95, may be purchased from Percom dealers or ordered direct from the factory. The Percom tollfree order number is 1-800-527-1592.

Payment for mail orders may be made by certilied check, ceshler's check or money order, or charged to a Master Card or VISA account. Texas residents must add 5% sales tax.

Percom Mini-Disk Drives Store More, Cost Less. -408

Percom mini-disk drives store more data, are more reliable, yet a 40-track Percorn drive costs \$100.00 less than a 35-track Tandy drive.

You can store over 102 Kbytes per disk on Percom TFD-100" 40-track drives, over 197 Kbytes per disk on TFD-2001 77-track

drives. A patch — supplied free on minidiskette — upgrades TRSDOS* for operation with the newer 40- and 77-track drives. Both TFD-100TM and TFD-200TM models are evailable in

one-, two- and three-drive configurations.

Prices start at \$399 for a single-drive TFD-100™, \$675 for a single-drive TFD-200TM. Drives are supplied with heavy-duty power supplies. Metal enclosure is finished in compatible silver

See your nearby Percom dealer or order direct by calling toll-free 1-800-527-1592.

Five-Inch Disks Store More Than Eight-Inch Disks! --

1980 — Percom Data Company has begun production of a double-density disk controller adapter for TRS-80° Model I computers.

Harold Mauch, president of Percom, made that announcement here today, saying that data stor-age capacity using the adapter and double-density disk operating sys-tem — which is included — can be increesed to es much es 354 Kbytes per minidiskette.

By comparison, the maximum storage for larger eight-inch disk systems used with the TRS-80°

Garland, Texas - June 25, Model I computer is about 290

Mauch said the PC card adapter, which plugs into the controller chip socket of the computer Expansion Interface, works equally well for either single-density or double-density storage, and users may continue to run programs under TRSDOS*, OS-80TM and other single-density operating systems with the adapter installed.

Price, for the plug-in adapter, the TRSDOS*-like double-density DOS and a utility for converting files and programs from single- to double-density format is \$219.95.

BACKGROUNDER

CRC ERROR! TRACK LOCKED OUT!

by the Technical Staff Percom Data Company

This problem started while we were studying an ennoying problem with the TRS-80° computer. Disk drives sold by Percom are realigned and tested before shipment. We noticed, however, that some disk drives would pass the Percom inspection but just would not work reliably on the inner tracks with e TRS-80° computer. These drives were within the manufacturer's specifications, and would function perfectly on other disk systems Percom manufactures — "perfectly" here meaning more then 50 million before mad without a manufactures. bytes read without error!

The disk read data separa-tion arrangement in the TRS-80° computer Expension Interfece uses an internal data separator of the FD1771 disk formatter/controller IC. Use of the FD1771 internal data separator is not recommended by Western Digital, the IC manufacturer. The following note appears on page 17 of the FD1771 data sheet:

> Internal date separation may work for some applications. However, for applications requiring high dete recovery reliebility, WDC recommends external data seperetion be

We suspected the defa separator because the problem was most severe on disk inner tracks where storage density is highest and deta separation is most critical.

To prove our point, e technicien breedboarded e stendard Percom data separetor circuit, and configured it to plug directly into the FD1771 IC socket of the TRS-80° computer controller.

When connected to the TRS-80° computer, a trouble-some drive functioned perfectly! We ran a BACKUP utility many times and never got a track lock-out. Before we added the external data separator circuit to the computer, this same drive would always lock out tracks, and would have difficulty reading from the inner (higher number) tracks.

The Percom data separator circuit fixes the mini-disk controller of the TRS-80° computer. The type of drives being used is ir-relevent; the circuit eliminetes disk read errors resulting from the inability of the Tandy controller design to reliably separate clock and data signels when reading high density inner tracks.

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

PERCOM DATA COMPANY, INC. 211 N. Kirby Street Garland, Texas 75042 (214) 272-3421

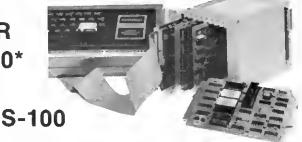
he trademark of Percom Data Company, Inc.

*trademark of Tandy Radio Shack Corporation which has no relationship to Percorn Data Company.

```
4395 ED73E848 92758
4389 78 92889
                                            (40E6H), SP
                                  LD
                                                               ; SAVE SP
                                            A, (EL)
                                  LD
                                                                BYTE TO A
438A FE3A
                 02050
                                  CP
                                                                ; END OF STATEMENT?
                                            Z,BlD5A
439C 282C
                 92988
                                  JR
                                                                YES
                                                                ; END OF LINE?
430E 87
430F C29719
                 92959
93999
                                  JP.
                                            NZ, SNERR
4312 23
4313 7E
                                                                END
                 93858
                                  INC
                                            RL
                                            A, (HL)
                                                                ; OF
                 03100
                                  LD
4314 23
4315 B6
                                  TMC
                 83159
                                            NI.
                                                                      PROGRAM
                                            (BL)
                 83248
                                  OR
                                                                ; YES
4316 CA7E19
                 Ø325Ø
                                  JP
                                            Z,197EH
4319 23
                                                                LINE
                 93399
                                  T NC.
                                            HL
431A 5E
                                            E, (HL)
                                                                   NUMBER
                 03350
                                  LD
43IB 23
                                  INC
                 03400
                                            ВL
43IC 56
                                            D,(BL)
                 83458
                                  I.D
                                                                         DE
431D EB
                 93599
                                  EX
                                            DE. SL
                                                                SAVE
                                            (LNNBUF), HL ; LINE NUMBER
;*** A JUMP OR CALL TO A USER
;* ROUTINE MAY BE PLACED HERE
;* NITHOUT AFFECTING LABEL
431E 22A240
                 93550
                                  LD:
                 83688 USROPT
                                  NOP
4321 00
                                  NOP
4322 00
                 63656
                                  NOP
4323 00
                 93799
                                                                ; TROM/TROFF ROUTINE-
                 83758
4324
     3A1B41
                                            A, (411BH)
                                  LD
4327 B7
                 93899
                                  OR
                                                                ; NO
4328 288F
                 03850
                                            Z.8ID59
                                  JR
                                  PUSB
432A D5
                 83988
                                            DE
432B 3E3C
                 Ø395@
                                  LD
                                            Ø32 AH
432D CD2A03
                                  CALL
                 84888
                                  CALL
4338 CDAPSE
                                            OPAPH
                 84858
                                            A, >
4333 3E3E
                 04100
                                  LD
4335 CD2A03
                                  CALL
                                            032AH
                 04150
4338 DI
                                  POP
                 84288
                                            DE
4339 EB
                 84258 BID59
                                  EX
                                            DE, HL
                 94399 B1D5A
                                  RST
                                                                ; NEXT BYTE TO A
433A D7
                                            19H
433B 11F842
                 84358
                                  ĽΦ
                                            DE, BIDLE
                                                                RETURN ADDRESS
433E D5
                 84488
                                  PUSE
                                            DE
                                                                   TO STACK
433F CB
                 04450 BlD5F
                                  RET
                                                                ; END STATEMENT
4348 FECF
                                  СP
                                            LBIDNT
                                                                ; LABEL IDENTIFIER?
                 84588
4342 CAB71F
                 84558
                                  JР
                                            2,1F07H
                                                                YES, NEXT LINE
                                            89 N
4345 D588
                 84698 B1D69
                                  SUB
4347 DA211F
                 84558
                                  JP
                                            C, 1F2IH
                                                                ; SYTE IS VARIABLE
434A FE3C
                 84788
                                  CP
                                            3CH
                                                                TOKEN?
434C D2E72A
                 84758
                                  ĴΡ
                                            NC, 2AE7H
                                                                : NO
                 84888 ; CHECK FOR SPECIAL CASES
                 84858 ;ENTRY: A=BASIC TOREN-888; HL POINTS TO TOKEN IN BASIC LINE
84988 CP OMTOK-888 ;IE COMMAND 'ON'?
434F FE21
                                                                YES
4351 2865
                 94959
                                  JR
                                            Z, CON
                                            NC, NOSPCS
                                                                OUT OF RANGE
4353 3012
                 85898
                                  JR
                                                                IS COMMAND 'GOTO'
4355 FEOD
                 95959
                                  CP
                                            GTOTOK-00H
                                                                OUT OF RANGE
4357 300E
                 95199
                                  JЯ
                                            C, NOSPCS
4359 283B
                 05150
                                  JΑ
                                            Z, CGOTO
                                                                COMMAND IS GOTO
                                                                ; IS COMMAND 'GOSUB'?
435B FE11
                 95299
                                  CP
                                            GSSTOK-80H
                                  JR
                                            z, CGOSUB
                                                                YES
435D 2826
                 05250
435F PEIF
                 95389
                                  СP
                                            RSNTOK-89 N
                                                                IS CONMAND 'RESURE'
                 85358
                                  JR
                                            Z, CRSM
                                                                YES
4361 2007
                                  CP
                                            IFTOK-80N
                                                                ; IS COMMAND 'IF'?
4363 FEØP
                 85488
                                                                ;YES
4365 2873
                 05450
                                  JR
                                            Z,CIF
                 05500 ; END SPECIAL CASE CHECK
4367 C35A1D
                 05550 NOSPCE JP
                                            1D6AH
                                                                ; NOT SPECIAL CASE
                 85688
                 05659 ; COMMAND RESDME
                 05700 CRSM
436A 11F248
                                  LD
                                            DE, 40 F2H
                                                                ; POINT DE TO ERROR
436D 1A
                 85759
                                                                ; ERROR 4 TO A
                                  LD
                                            A, (DE)
                                                                NO ERROR?
436E B7
                 05000
                                  OR
                                            2,19AØH
436F CAABIS
                 95959
                                  JP
                                                                ; RESUNE CALL ILLEGAL
4372 3C
                 95999
                                   INC
4373 329A40
4376 12
                 85958
                                  LD
                                            (499AH),A
                                            (DE) , A
                 96999
                                  LD
4377 D7
                 06059
                                  RST
                                                                NEXT BYTE TO A
                                            108
                                            C,1PClB
4378 DAC11F
                 96199
                                  JΡ
                                                                NUMBER
437B CACLLE
                 06150
                                  JΡ
                                            Z, IPC1B
                                                                ; END STATEMENT
437E FE07
                 86299
                                  CP
                                            87B
                                                                ; NEXT?
4388 CACDIF
                 86258
                                  JР
                                            Z, 1FCDH
                                                                ; YES
4383 1815
                 86389
                                                                PROCESS AS LABEL
                                            LNLBL
                 Ø6 35 9
                 86400 ; COMMAND GOSUB. SEE CGOTO
4385 ØEØ3
                 86458 CGOSUB LD
                                            C,03
1963H
                                                                # ADDITIONS TO STACK
                                                                ROOM IN RAM?
4387 CD6319
                 96599
                                   CALL
                 96559
438A C1
                                  POP
                                            BC
                                                                ; SAVE RETURN
                                                                ; SAVE CURR. LOCATION ; LINE # TO DE
438B E5
                 86698
                                   PUS N
                                            HT.
                                            DE, (LNNSUF)
438C ED5BA240
                 06650
                                  LD
4398 D5
                 96788
                                  PUSR
                                            DΕ
                                                                ; SAVE LINE #
4391 3E91
                 Ø675Ø
                                   [.D
                                            A, 9IR
                                                                GOSUB TOKEN
4393 F5
                 96 999
                                   PUSH
                                            AF
                                                                   TO STACK
4394 33
                 96 85 9
                                   INC
                                            SP
                                                                1F REG. NOT NEEDED
4395 C5
                 86 98 8
                                   PUSE
                                            BC
                                                                RESTORE RETURN
                 B695B
                 97999 ;COMMAND GOTO: JUMP TO LAHEL SEARCH ROUTINE IS REQUIRED, ELSE BASIC 97959 ;ENTRY: HL POINT TO COMMAND TOKEN IN BASIC LINE 97188 ;EXIT: HL POINT TO FIRST CHARACTER OF SOURCE LABEL OR LINENUMBER
                                   (NOT APPLICABLE FOR ALL CASES OF RESUME)
                  07150 :
                                                                                                          Program continues
```

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```
07200 CGOTO
                                                              ; NEXT BYTE
4396 D7
                                 RST
                                           10H
                                           C, 1EC2H
                                                              ; NUMBER, JP TO ROM
4397 DAC21E
                07250
                                 JΡ
                07300
                07350 ; LINE LABEL: SEARCHES BASIC PROGRAM FOR A LINE BEGINNING WITE LABEL IDENTIFIER '*'. 87480 ; CHECKS FOR SOURCE AND OBJECT STRING MATCH, UL ERROR AND CN ERROR 07450 ; ENTRY: HL POINT TO FIRST CHARACTER OF SOURCE LABEL
                87588 ; EXIT: BL POINTS TO BYTE BEFORE OBJECT ROUTINE (END OF LINE WITH OBJ LABEL).
                07550 LNLBL
439A 2B
                                 DEC
                                           NI.
                                                              ; NEXT BYTE TO A ; END STATEMENT, ERROR
                                 CALL
439B CD6144
                 07 60 B
                                           NXTRYT
439E CA9719
                 07650
                                 JP
                                           Z, SNE RR
                                                              LABEL IDENT. TO C
                                           C, LBIDHT
43A1 BECP
                 07700
                                 LD
                                                              SAVE ADD. SOURCE LABEL
43A3 226B46
43A6 CD2Ø44
                 97759
                                 LD
                                           (SRLBPT), HL
                                                              FIND OBJ. LABEL
                                  CALL
                 07000
                                           CF KMS
43A9 D2D91E
                 07 050
                                  JΡ
                                           NC, ULERR
                                                              ; NO MATCH FOUND
43AC EB
                 87 98 B
                                  EX
                                           DE, HL
43AD 7E
                 07 950
                                 LD
                                           A, (BL)
                                                               ; END
43AE 23
                 00000
                                  INC
                                           HL
                                                               ; OF
43AF 86
                 00050
                                 OR
                                           (BL)
                                                                    PROGRAM?
43BØ 1E2Ø
                 00100
                                  LD
                                           E,32D
                                                               ; CN ERROR
43B2 CAA219
                                  JP
                                           Z, ERROR
                                                               ;YES, ERROR
                 00150
                 00200
                                  DEC
                                                               POINT TO
4385 2B
                                           RL
                                                               ; END PREV.LINE
43B6 2B
                                 DEC
                 99259
                                           RL.
4387 C9
                 08300
                                  RET
                 00350
                 98499 ; CONMAND ON: SEE CGOTO
                 00450 CON
                                                               ; NEXT BYTE TO A
                                  RST
                                           108
4388 D7
                                  CP
                                           9EN
                                                               ; ERROR TOKEN?
43B9 PE9E
                 00500
                 08550
                                  JR
                                           Z, CONER
                                                               ; YES
43BB 284D
43BD CD1C2B
                                                               ; EVALUATE ARGUENENT
                 88688
                                  CALL
                                           2B1CB
                                           A, (BL)
                                                               NEXT BYTE TO A
43C0 7E
                 00650
                                  LD
                                                               SAVE IN B
43C1 47
                 08700
                                  LD
                                           B,A
43C2 FE9I
                 08750
                                           91B
                                                               GOSUB?
                                  CP
43C4 2003
                 96999
                                  JR
                                           z, CON1
                                                               :YES
43C6 CF
                 00050
                                  RST
                                           BON
                                  ADC
                                           A.L
43C0 2B
                88958
                                 DEC
                                           ВĹ
43C9
     48
                09000 CON1
                                 LD
                                           C,E
                                                              ; ARGUEMENT TO C
43CA ØD
                09050 CNTCMA
                                 DEC
                                                              SPECIFIED #?
43CB 2004
                09100
                                 JR
                                           HZ, NXTCMA
                                                              HO, HEXT COMMA
43CD 78
                09150
                                 LD
                                                              RESTORE A
                                                              ; EVALUATE & DO
43CE C34543
                09200
                                 JP
                                           B1068
43D1 D7
                89258 NXTCMA
                                 RST
                                           10N
                                                              ; NEXT BYTE TO A
43D2 B7
                09300
                                 OR
                                                              ; END STATEMENT?
                                           A
43D3 CØ
                09350
                                 RET
                                                              ;YES
                                                              ; COMMA?
43D4 FE2C
                 89488
                                 CP
                                                              ; NO
43D6 20F9
                 09450
                                 JR
                                           HZ, NXTCMA
43D8 18F8
                 09500
                                 JR
                                           CNTCMA
                                                               ;YES, COUNT IT
                 09550
                 09600 ; CONMAND IF: SAME AS BASIC
                 89658 ; EMTRY: HL POINTS TO IF TOXEN 89700 ; EXIT: HL POINTS TO ARGUEMENT
                                                                   END OF LINE
                                                             OR
                                                               NEXT BYTE TO A
43DA D7
                 89758 CIP
                                 RST
                                           108
                                                               ; EVALUATE ARGUEMENT
43DB CD3723
                 09000
                                  CALL
                                           2337B
                                           A, (HL)
                                                               ; NEXT BYTE TO A
43DE 7E
                 09050
                                 LD
43DF PE2C
                 09900
                                  CP
                                                               ; COMMA?
                                           Z,1D78H
                                                               YES, NEXT BYTE
43E1 CC701D
                 09950
                                  CALL
                                                               ; THEN?
43E4 FECA
                 10000
                                  CP
                                           OCAR
                                  CALL
43E6 CC701D
                 10050
                                           Z, 107 8R
                                                               ; YES, NEXT BYTE
43E9 28
                 10100
                                  DEC
                                           ar.
                                  PUSK
43EA E5
                 10150
                                           BL
                                           89948
43EB CD9409
                                  CALL
                 10200
43EE E1
43EF 2007
                 10250
                                  POP
                                           BT.
                                           Z,B2056
                 10300
                                  JR
                 10350 B204F
                                  RST
43F1 D7
                                           10B
43F2 DAC2IE
43F5 C33F43
                                           C,1EC2H
B1D5F
                 10400
                                  JP.
                                  JΡ
                                                               JUMP TO 'PATCH'
                 10450
                 10500 B2056
43F0 1601
                                  LD
                                           D.01
                 10550 B2058
43PA CDØ51F
                                  CALL
                                            1FØ5N
                 10600
                                  OR
43FD 87
43FE CØ
                 10650
                                  RET
43FF D7
                 10700
                                  RST
                                            109
4400 PE95
                 10750
                                  CP
                                            95B
4402 20F6
                 10000
                                           NZ,B2958
                                  JR
4484 15
                 10050
                                  DEC
                                            D
4405 20F3
                                           NZ,B2050
                 10900
                                  JR
4497 15
                 10950
                                  DEC
                                            D
4400 18E7
                 11000
                                            8284F
                                  JR
                 11050
                 11100 ; CONMAND ON
                                      ERROR: SEE CGOTO
440A D7
                 11150 CONER
                                  RST
                                            10N
4488 CF
                 11200
                                  RST
                                            08B
                 11250
                                  ADC
440C 0D
                                            A.L
                 11300
                                  DEC
                                            NL
448D 28
440E D7
                 11350
                                  RST
                                            108
                                                               ; HEXT BYTE
                                                               NUMBER, NORMAL BASIC
440F DA731F
                 11400
                                  JP
                                            C,1F73B
4412 E5
                 11450
                                  PUSH
                                            HL
4413 D7
                 11500
                        CONERL
                                  RST
                                            108
                                                               ; HEXT BYTE, END STATEMENT?
4414 20PD
                 11550
                                  JR
                                            HZ, COMER1
                                                               ; NO
                                  EX
                                                               YES, SAVE IN STACK
4416 E3
                 11600
                                            (SP),HL
                                                                                                                 Program continues
```

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PIGSKIN

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Play football ageinst a friend or your computer with PIGSKIN. Featuring a graphic display of the field, the ball and scoreboard statistics, when you have the ball you choose from eleven offensive pleys while your opponent picks which of the seven defenses might stop you.

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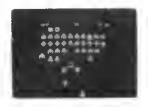
```
4417 CD9A43
                                 CALL
                                           LNLBL
                                                              FIND OBJECT LINE
                11650
                                                              POINT TO BEG.OBJ.LINE SAVE ADD.LINE
441A 23
                11708
                                 INC
                                           HL
441B 22F040
                                           (40POB),BL
                                 LD
441E E1
                11000
                                 POP
                                           HL
441F C9
                11858
                                 RET
4426 ED5BA440 11950 CFXHS
                                           DE, (BPRPTR)
                                                              POINT DE TO BASIC PROG.
                12000 CFKMS1
4424 CD3344
                                 CALL
                                           FHDKEY
                                                              FIND LINE BEG. WITH KEY
4427 B7
                 12050
                                                              : IS A 0?
                                 OR
                                                              YES, END PROGRAM
NEXT BYTE TO A
4428 C8
                12100
                                 RET
                 12150
                                           10B
4429 D7
                       CFKMS2
                                 HST
                                                              DE POINTS TO OBJ. LABEL
                 12200
442A EB
                                           DE, KL
                 12250
                                 PUSB
                                                              ; SAVE ADD. NEXT LINE
442B E5
                                 CALL
442C CD4444
                 12300
                                           STRMCH
                                                              MATCH STRINGS
                                                              ; ADD. HEXT LINE
442F D1
                 12350
                                 POP
4430 30F2
                 12400
                                 JR
                                           HC, CFKHEl
                                                              ; NO MATCH, TRY AGAIN
4432 C9
                 12450
                                  RET
                 12500
                 12550 ; FINDREY: SEARCH BASIC PROGRAM FOR LINES BEGINNING WITH SEARCH KEY
                12600; ENTHY: SEARCH KEY IN REGISTER C
12650; DE POINTS TO LINE WHERE SEARCH IS TO BEGIH
12700; EXIT: A=0 IF END OF PHOGRAM; IX POINTE TO LINE WITH LAGEL
12750; HL POINTS TO ADDRESS OF OBJECT KEY; DE POINTS TO THE HEXT LINE, THE
                        OBJECT HOUTINE
                 12888 ;
                                 C = SEARCH KEY
4433 EB
                12850 FNDKEY
                                 εx
                                           DE, BL
                                                              ;START ADD. DE TO HL
                                 PUSH
4434 E5
                 12900
                                           HL
                                                              ;SAVE
                                                                 IN IX
                 12950
4435 DDE1
                                 POP
                                           IX
                                           A, (EL)
4437 7E
                 13000
                                                              : END OF
                                 LD
                 13050
4438 5F
                                 LD
                                           E,A
4439 23
                 13100
                                  INC
                                                              ; PROGRAM
                                           HL
                 13150
443A B6
                                 OR
                                           (RL)
                                                              YES
443B CØ
                                 RET
                 13200
443C
     56
                 13250
                                                              DE POINTS TO HEXT LINE
                                 LD
                                           D. (BL)
443D 23
                 13300
                                  INC
                                           HL
                                                              FIRST BYTE
443E 23
                 13350
                                  IRC
                                                               ; TEXT
                                           HL
443E D7
                 13400
                                                                     TO
                                 RST
                                           104
4440 B9
                 13450
                                 CP
                                                               :=SEARCH KEY?
4441 20F0
                                  JR
                                           HZ, FNDKEY
                 13500
                                                              ;HO, TRY HEXT LINE
4443 C9
                 13550
                                  RET
                 13600
                 13650 ; STRING MATCH: COMPARES TWO STRINGS, INSEDDED SPACES IGNORED. DELIMITERS ARE
                        ':' ',' AND 0
                 13766 ; ENTRY: ADDRESS OF SOUNCE LABEL IN (SRLBPT); DE POINTS TO OBJECT LABEL
                 13756 ; EXIT: CARRY SET IF MATCH FOUND
                 13888 STRMCH LD
                                                              POINT TO SOUNCE
4444 2A6846
                                           HL, (SRLBPT)
4447 28
                 13850
                                 DEC
                                           ĦT.
                 13900
444A 1B
                                 DEC
                                           DE
                                                               ; NEXT BYTE TO A
4449 CD6144
                 13950 STREC1
                                           NXTBYT
                                 CALL
                 14000
444C 47
                                 LD
                                           B,A
                                                               ; SAVE IN B
                                                               POINT HL TO OBJ.WORD
444D EB
                 14858
                                           DE, HL
                                 EX
444E 288A
                 14100
                                           Z, ENDSCE
                                                               ; JP IF END SOURCE WORD
; NEXT BYTE OBJ. WORD
                                  JR.
4450 CD6144
                 14150
                                  CALL
                                           NXTBYT
4453 EB
                 14200
                                  EX
                                           DE.BL
4454 CB
4455 BB
                14250
14300
                                  RET
                                                               MATCH FOUND
                                                               BYTES MATCH?
                                  CP
                                           В
                                                               ; YES, COMPARE HEXT BYTES
4456 20F1
                                  JR
                                           Z,STRMC1
                 14350
                                                               ; CANCEL CARRY, NO MATCH
4458 AF
                 14400 NONCH
                                  XOR
                                           A
4459 C9
                 14456
                                  RET
445A CD6144
                 14500 ENDSCE
                                           NXTBYT
                                                               ; ALSO END OBJ. WORD?
                                  CALL
                                                               ; NO, NO MATCH
; SET CARRY
445D 20F9
                                           NZ, NONCH
                 14550
                                  JR
445F 37
                 14600
                                  ECF
4460 C9
                 14650
                                  RET
                 14700
4461 D7
                 14750 NXTBYT
                                  HST
                                           108
                                                               ; RETURNS HEXT BYTE IN A
                                                               ; AND Z FLAG SET
4462 C8
4463 FE2C
                 14886
                                  RET
                                  СP
                 14850
4465 C9
                 14900
14950
                 15000 ; LENGTE STHING: COUNTS LENGTB STRING TO DELIBITER 15050 ; ENTRY: HL POINTE TO STRING 15100 ; EXIT: B = LENGTB OF STRING
4466 0600
                 15150
                                 LD
                                                               ; INITIALIZE COUNTER
                        LENETR
                                           B. 00
4468 7E
                 15 200 LENST1
                                 LD
                                           A, (EL)
                                                               NEXT BYTE
4469 B7
                 15250
                                                               ; 8 ?
                                  DR
                                           Α
446A C8
                 15300
                                  RET
                                                               YES, END STRING
446B FE3A
                 15350
                                  CP
                                                               ; YES, END ETRING
446D CØ
                 15488
                                  RET
446E FE2C
                 1545€
                                  CP
                                                               ; COMMA?
4470 CB
                 15500
                                  RET
                                                               ; YES, END STHING
                                                               COUNT IT
4471 04
                 15550
                                  INC
4472 23
                 15600
                                  INC
                                           HL
                                                               POINT TO NEXT BYTE
4473 18F3
                 15650
                                           LENET1
                 15700
                 15750 ; COMMAND LABEL: CHECKS FOR BASIC LINE OR COMMAND ENTERED
                 15600
                        ; ENTRY: USER ENTRY IN BASIC INPUT BUFFER
                                                               ;DISABLE INTERUPTS ?
4475 CDC646
                 15850
                                  CALL
                                           INTOFE
                        CMDLBL
4478 25
                 15900
                                  PUSH
                                           AΕ
                                                                                                           Program continues
```

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SUPER NOVA® If you and your TRS-80 have longed for a fast-peced ercede-type game that is truly a challenge, then **SUPER NOVA** is what you've been weiting for. In this two player mechine-language game, large asteroide float ominously around the screen. Suddenly your ship appears and you must dearroy the esteroids before they destroy you! (But watch out because big asteroids break apart into little ones.) The controls that your ship will respond to are thrust, rotate, hyperspace, and fire. All right! You've done it! You've cleared away all the exteroids! But what is that saucer with the laser doing? Quick! You must destroy him fast because that guy's accurate!



GALAXY INVASION® The sound of the klaxon is calling you! Cruel and crafty invaders have been spotted in battle formation warping toward Earth at en incredible speed. Suddenly, your ship materializes just below the huge flock of invaders. Quickly and skillfully you shift right and left as you carefully fire your lesere at them. But wetch out! A few ere breeking out of the convoy end flying straight at you! As the whine of their engines gats louder, you place your finger on the fire button knowing all too well that this shot must connect—or your mission will be permanently over! With sound effects!



ATTACK FORCE® Your TRIS-80 ecreen has been transformed into a maze-like playfield for this game. As your ship appears on the bottom of the screen, eight alien remships appear on the top. All of them are traveling at flank speed directly at you! Quickly and boldly you move toward them and firs missiles to destroy them. But the more aliens you destroy, the fester the remaining ones become. If you get too good you must endure the wreth of the keeper of the mezafield: the manacing "Flagship". You must destroy him fast because, as you will find out, that guy's accurate! With sound effects!



COSMIC FIGHTER® With thousends of stars whizzing by you, your **SPACE DESTROYER** ship comes out of hyperspace directly under a convoy of aliens. Almost effortlessly, you skillfully destroy every leat one. But before you can congratulate yourself, another set eppsers. These seem to be slightly more intelligent then the first set. Quickly you eliminate all of them, too. But your fuel supply is rapidly diminishing. You must still destroy two more sets before you can dock with your space station. All right! The space station is now on your scanners! Oh no! Intruders have overtaken the station! You must skillfully fire your neutron leasns to eliminate the intruders from the station before your engines run out of fuel and explode! With sound!



METEOR MISSION II® The second **Big Bang** has occurred and the galaxy is full of strey esteroids and meteors. As you look through your space port you see a belt of asteroids drifting across the screen blocking your path to the safety of the space station above. But be careful because meteor showers, exploding suns and inveding aliens may strike your ship and send it hurtling back to ground level. How many times can you and your opponent maneuver through those obstecles before time runs out? With sound affects!

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```
4479 BB
                1595B
                                          AF, AF'
                                                              SAVE AF
447A D9
                15989
                                                              BAVE REGISTERS
                                 EXX
447B F1
                1685B
                                 POP
                                                              RESTORE AF
447C 3837
                16100
                                 JR
                                           C, LINEIS
                                                              BASIC LINE ENTERED
                1615B ; LABEL MENU: CHECKS INPUT AGAINST LABEL COMMANDS
                16786 ; ERIY: C = NUMBER OF COMMAND, B FOR NO MATCH
447E 0E09
                1625B LBLMNU
                                LD
                                           C,08
                                                              ; INITIALIZE COUNTER
                                          DE, WRDLSY
SL, (40E6H)
                                                              POINT TO STARY OF LIST POINT TO ENTRY IN BUFF.
4408 116D45
                 163BB
                                 LD
4483 2AE64B
                16359 LBLN91
                                 LD
4486 D7
                 164BB
                                 RST
                                           198
                                                              FIRST BYTE OF ENTRY
4487 BC
                 15459
                                 THC
                                                              INCREASE COUNTER
                 16588 NXTWRD
44BB 1A
                                 LD
                                           A, (DE)
                                                              ; BYYE TO A
4489 B7
                 15550
                                 OR
                                                              : END WORD?
44BA 13
                 1560B
                                 INC
                                           DE
                                                              POINT TO NEXY BYYE
44BB 2BFB
                 16658
                                           SZ, NXTWRD
                                                              ; NOT BEG. OF WORD
                                  JΗ
                 167BC LBLMN2
44BD 1A
                                 LD
                                           A, (DE)
                                                              FIRST BYTE WORD
                 1675
44BE FEBB
                                 C₽
                                           BOH
                                                              : END LINT?
449B 2692
                 15888
                                 JR
                                           NZ, NXTWR1
                                                              : NO
4492 AF
                 16050
                                 I OH
                                                              ; YES
4493 4F
                 15900
                                                              14 IS 9 FOR NO MATCH
                                 LD
                                           C,A
4494 B7
                 16950 NETWR1
                                                              END WORD?
                                 OH
4495 28B7
                 17898
                                 JR
                                           I,JMPR
                                                              :YES. FIND ROUTISE
                                                              ; NO, BYTES = ?
; NO MATCH, TRY NEXT WORD
4497 BE
                 17850
                                 CP
                                           (BL)
4498 28E9
                 17109
                                 JĦ
                                           NI, LBLNN1
449A D7
                                                              NEXY BYTE
                 1715B
                                 RST
                                           188
449B 13
                 17289
                                 INC
                                           DΕ
449C 1BEF
                 17250
                                 JR
                                           LBLNN2
                                                              BYYEE MATCH SD FAR
                 1736B
                       JUNPER: JUNPE TO ROUTINE CORRESPONDING TO COMAND
                 17350
                        PENTRY: REG. C = NUMBER OF WORD IS WORD LIST MATCHING ENTRY: B IF NO MATCS
                                           B, 68
449E 868B
                 1740B JMPR
                                 LD
44A6 CB21
                 17459
                                 SLA
                                                              NUMBER * 2
44A2 B5
                 17500
                                 PU5B
                                           BL
44A3 21B646
                17559
                                 LD
                                           HL, JMPTBL
                                                              POINT TO JUNE TABLE
                                                              , ADDRESS
44A6 89
                 1769B
                                 ADD
                                           HL,BC
44A7 7E
                 1765#
                                 LD
                                           A, (BL)
                                                                  OF
44AB 23
                 17786
                                 ISC
                                           HL
                                                                   ROUTINE
44A9 56
                 17756
                                 LD
                                           B, (BL)
                                                                    TO
44AA 6F
                 17899
                                 f.n
                                           L,A
                                                                       HT.
44AB E3
                 17858
                                                              ; ADDRESS TO STACE
; JUSP TO ROUTINE
                                 EX
                                           (SP),BL
44AC C9
                 17909
                                 RET
                 17950 NONENU
44AD D9
                                                               ; NO MATCH, RESTORE REG'S
                                 EXX
                                                              RESTORE AP :ENABLE INTERUPTS?
44AP CDBC46
                18699
                                 EX
CALL
                                           AF, AF'
44B2 C37544
                18198 EXCMDL
                                 JР
                                           CMDLBL
                10158
                18158
18288 ; BASIC LINE INPUT: LB ERROR CHECK
18258 ; ENTRY: BASIC LINE IN INPOT BUFFER. LINE NUMBER IS DE
18388 ; IF MATCH IS FOUND AND LINE NUMBER ARE THE SAME, LINE IS BEING EDIYED.
18358 LIKEIF LD BL, (4865E) ; POINT TO ENTRY IN BUFF
18488 RST 188 ; FIRST BYTE ENTRY
44B5 2AE640
44B8 D7
                                           C, LBIDRY
44B9 BECF
                 18459
                                 LD
                                                              ; IS IT
44BB B9
                 10500
                                 CP
                                                                 LABEL IDENTIFIER?
44BC 28EF
                 18559
                                 JR
                                           HI, NOMENU
                                                              NO, IGNORE
44BE CD6144
                                                              ENTRY?
                 18689
                                 CALL
                                           NX TBYY
44C1 2BEA
                 18658
                                 JΗ
                                           X, NOMENU
                                                              : 90
44C3 726B45
                 1876B
                                           (BRLBPT), HL
                                                              JEAVE ADORESE LABEL
44C6 CD2944
                 10750
                                 CALL
                                           CFKMB
                                                              ; MATCH IN PROGRAM?
44C9 3BE2
                 1 B Ø B #
                                 JΗ
                                           HC, NOMENU
                                                              , NO, OE
44CB D9
                1005B
                                 EXX
44CC 05
                18980
                                 POSE
                                           DE
                                                              GET LINE 4 ENTRY
44CD D9
                18950
                                 EXX
44CE D1
                 190B9
                                 POP
                                           DE
44CF DD6EB2
                19850
                                 LD
                                           L,(12+2)
                                                              ;LINE & OBJECT
44D2 DD6603
                19198
                                 LD
                                           H, (IZ+3)
                                                              ; TO HL
44D5 DF
                 1915B
                                 RST
                                           18#
                                                              ; SAME 4?
44D6 28D5
                 19288
                                 JH
                                           X, NOMENU
                                                               ;YES, SAME LIKE (EDITED)
44DB C39246
                 19256
                                 TP.
                                           LBLERR
                                                               LABEL ALREADY ASSIGNED
                 19340
                                                              ; ENTER LABEL TO BASIC BLOCK
; INIVIALIZE FOR BASIC
44DB CDE444
                19359 ENTLBL
19400 EXTLBL
                                 CALL.
                                           LBLBAS
44DE CDSD1B
                                 CALL
                                           BASINI
44E1 C3B646
                 19459
                                  JР
                                           READY
                                                               JUMP TO READY
                195B9
                 19550 LBLBAS
                                                              ; ENYER ON CMD 'BASIC..'
44E4 7E
                                 LD
                                           A,(HL)
44E5 B7
                 19688
                                 OR
                                                              10 ?
                                                              YES, NO SWITCH
44E6 2858
                 1965B
                                  .TR
                                           Z.CHRCK
44EB FE93
                 197BB
                                 CP
                                           REMTOR
                 1975B
44EA 288E
                                 JR
                                           Z. REMLBL
                                                               ; YES
44EC FEB6
44EE 2B1C
                 19000
                                 CP
                                           DELTOK
                                                               DELETE TOREN?
                 19050
                                  JR
                                           E, DELLBL
                                                               ; YES
44FB 1BCB
                 19909
                                  JH
                                           EXCMDI.
                                                               INOT RECOGNIZED
                 19950
                 20000 ; DELETE REMARKS
44F2 8E93
                 20050 DELREM
                                 LD
                                           C, REMTOS
                                                              REM TOKEN IS SEARCH SEY
44F4 CD1145
                 201B0
                                  CALL
                                           DELLB9
                                                               FIND AND DELETE
44F7 C3B546
                 26156
                 267BB
                 20259 ; CONVERT TO LINE NUMBERS AND WRITE REMARKS FOR LABELS
44FA CD3845
                 29300 REMLBL CALL
                                           CBECK
                                                               ; LABEL TO BASIC
44FD BECF
                 20350
                                  LD
                                           C, LBIONT
                                                               ; LABEL IDNT. IS SEARCH TEY
                                                                                                           Program continues
```

Poor Man's Floppy

HIGH SPEED CASSETTE SYSTEM



Now the widely ecclaimed JPC Cassatta System is available for your TRS-80° computer. The prica is only \$90.00

TC-8 Cassette System JPC Products Albuquerque, NM Kit: \$90 Assembled: \$120

by Carl A. Kollar

Iguess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of Microcomputing had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute eassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronies, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no [Reprint of June 1980 Review, 80 Microcomputing]

ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ ×11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Communds and Features

SAVE"filename": Saves your BASIC program on cassette.

LOAD: Reads the next BASIC program from the cassette.

LOAD"filename": Searches for and loads the specified file from cassette.

LOAD? and LOAD?"filename": Reads file from cassette, and compares contents to memory.

LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key. LOADN"filename"; Same as above except the tape will stop at the end of the program named. KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.

RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.

RUN"filename": TC-8 searches for a specified program and runs it immediately.

PUT"filename": Same as SAVE "filename", except it is for use with system tapes.

GET: Same as LOAO, except it is for use with system tapes.

GET"filename": Same as LOAD "filename", except it is for use with system tapes.

GET? and GET?"filename": Same as LOAD? and LOAD?"filename", except it is for use with system tapes.

GETN and GETN"filename": Same as

LOADN and LOADN"filename", except it is for use with system tapes.

OPEN: Required before cassette input or output of a data file can be attempted.

CLOSE: Required to end a cassette data file. PRINT#; Allows numerical or string data to be output to a cassette file.

INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age II), loaded about 30 of his programs from his Radio Shaek format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

Try that on your regular cassette system; you'll wear out the reset button.

ORDER NOW

To order your TC-8 kit, send your check or money order for \$90.00 plus \$3.50 postage and handling to JPC PRODUCTS CO., 12021 Paisano Ct., Albuquerque, NM 87112 (New Mexico residents add 4% sales tax). Credit card orders accepted by phone or mail. Personal checks will delay shipment. We will otherwise immediately ship you the TC-8 kit, the cabinet, the ribbon cable, the power adapter, an instruction manual, and a eassette containing the software.

JPC PRODUCTS CO.
Phone (505) 294-4623
12021 Paisano Ct.
Albuquerque, N.M. 87112

```
DE, (BPRPTR)
                                                         POINT TO BASIC PROG.
44FF ED5BA449 28499
4583 C03344
               20450 RENLB1
                              CALL
                                        PHDREY
                                                          FIND LINE NITH REY
               20500
                               OR
                                                          : END PROG?
4586 B7
4597 CB
               28558
                               RET
                                                          YES
450B 3693
               20600
                               LD
                                        (HL), RENTOK
                                                          REPLACE WITH REN
458A 18F7
               20650
                               JR
                                        REMLB1
                                                          ; NEXT LINE
               20700
               20750
                     ; CONVERT TO LINE NUMBERS, DELETE LABELS
458C CD3845
               20000 OPLLBL
                              CALL
                                       CRECK
                                                          LABEL TO BASIC
                                                          LABEL IDNT. IE SEARCH KEY POINT TO BASIC PROGRAM
               20050
                               LD
                                        C, LBIDNT
458F BECF
4511 ED5BA448
               20900 DELLB0
                               LD
                                        OE, (BPRPTR)
4515 CD3344
               20950
                     DELLB1
                               CALL
                                        FHDKEY
                                                          FIND LINE BEG. WITH REY
4518 B7
4519 CB
               21000
                               OR
                                                          END PROG?
                               RET
                                                          . YES
451A C5
               21199
                               PUSB
                                        BC
                                                          SAVE KEY
451B DDE5
               21150
                               PUSR
                                        IX
                                                          BEGINNING LINE
               21288
21258
451D 2AF94B
                                        BL. (SCLRPT)
                                                          POINT TO VARIABLES
                               C.I
4520 ED52
                                        BL, OE
                                                          NUMBER OF BYTES TO MOVE
4522 E5
               21300
                               PUSB
                                                          1 TO
4523 C1
               21350
                               POP
                                        ВC
                                                              BC
4524 E1
               21488
                               POP
                                        НL
                                                          BEG.LINE TO HL
4525 EB
               21458
                                        DE, RL
                               EX
4526 EDB#
               21500
                               LDIR
                                                          MOVE & DELETE
4528 ED53P948
               2155₽
                                        (SCLRPT), DE
                                                          HEW SCALAR POINTER
                               LD
452C DDE5
               21600
                               PUSE
                                                          BEG. LINE
452E D1
               21650
                               PDP
                                        DE
                                                             TO DE
452F CDPC1A
               21700
                               CALL
                                        1AFCH
                                                          WRITE LINE POINTERS
4532 DDE5
               21758
                               PUSH
                                        ĮΧ
                                                          BEG. LINE
4534 D1
               21888
                               POP
                                        DE
                                                             TO DE
4535 C1
               2185B
                               POP
                                        BC
                                                          RESTORE SEARCH REY
4536 18DD
                21988
                               JR
                                        DELLB1
                                                          HEXT LINE
                2195₿
                22000
                      ; CHECK: CHECKS BASIC PROGRAM FOR COMMAND WHICH MAY TAKE A LABEL
                22050
                               CALLS APPROPRIATE PROCESSING ROUTINE & WRITES LINE HUMBER FOR LABEL
453B 2AA44B
                22100
                      CHECK
                               מגז
                                        HL, (BPRPTR)
                                                          POINT TO BASIC PROG.
453B 2B
                2215B
                               DEC
                                        RL.
453C 2B
                22200
                               DEC
                                        RT.
                                                          RETURN ADDRESS
                22250 CHECK®
                                        DE, CHECK &
453D 113D45
                               I.D
                                                             TO STACK
                22388
                               PUSE
4540 D5
                                        DE
                                                          HEXT BYTE
                22358 CRECX1
                                        198
4541 D7
                               RST
               22400
                                        HI, CHECK 2
                                                          INOT END STATEMENT
4542 2010
                               JR.
                                                          : END STATEMENT?
                                         . .
4544 FE3A
                22450
                               CP
                                        Z, CHECK 1
                22500
                                                          TYES
                               JR
4546 28F9
                                                          SAVE RETURE
                22550
22600
4548 Dl
                               POP
                                        DE
                                                          ADDRESS LINE
                               IBC
                                        ĦL
4549 23
                2265B
                                                          ; TO
454A E5
                               PUSR
                                        HL.
454B PDE1
                22788
                               POP
                                        ΙY
                                                                IY
                                                          END
454D 7E
                22758
                               LD
                                        A, (BL)
454E 23
                22000
                               THC
                                        HL.
                                                          ; OF
                                                                PROG?
454F B6
                22050
                               OR
                                         CHLY
                22988
4550 CB
                               RET
                22950
                                         DE
                                                           RESTORE RETURN
4551 D5
                               PUSR
                23000
4552 23
                               IHC
                                         HL
                                                           LINE
4553 5E
                23858
                                LD
                                         E, (RL)
                                                           , NUMBER
4554 23
                23100
                                IHC
                                         HL
                                                                TO
                23150
                                LD
                                         D,(HL)
4555 56
4556 ED53A24B
               23290
                               LD
                                         (LNHBUF) DE
                                                           SAVE LINE 4
455A 18E5
                2325₽
                                JR
                                         CHECK 1
                                                           BEGIN CHECK OF LINE
                23300 CRECK2
                                         ONTOK
                                                           ; DH TOKEN?
455C PEA1
                               CP
                                                           YES, JUNP
455E 2814
                23350
                                JR
                                         Z, PRCSOH
4560 PE8D
                23400
                                         GTOTOR
                                CP
                                         Z. PRCSGG
4562 2828
                23458
                                JR
                                                           YES. JUHP
4564 FE91
                23500
                                СP
                                         GSBTOR
                                                           GOSUB TOKEN?
4566 2024
4568 PE9F
                2355B
                                JR
                                         Z, PRCSGG
                                                           YES, JUMP
                                                           RESURE TOKEN?
                23600
                                CP
                                         RSMTOK
                23658
                                JR
                                         Y, PRCSRM
                                                           ; YES, JUHP
456A 2891
                23788
456C C9
                                RET
                23750
                23000 ; PROCESS RESDME: SEE PROSGG
456D D7
                23050 PRCSRN
                              RST
                                         10H
                                                           INEXT BYTE
456E PE87
                23900
                                         HXTTOK
                                                           : RESUME HEXT?
4578 CB
                23950
                                RET
                                                           ; YES
4571 2B
                24000
                                DEC
 4572 1010
                24858
                                JR
                                         PRCSGG
                                                           ; PROCESS AS GOTO/GDEUB
                24150 ; PROCESS ON: SEE PROSGG
4574 D7
                24200 PRCSON
                               RST
                                         168
                                                           , NEXT BYTE
                                         NE, PRCSO1
4575 2002
4577 2B
                24250
24300
                                JR.
                                                           INOT END STATEMENT
                                DEC
                                         RL
4578 C9
                2435B
                                RET
                24498 PRCSO1
                                                           OH GOTO?
4579 PE0D
                                CP
                                         GTOTOK
                                JR
                                                           YES, OK
457B 288A
                24458
                                         Z. PRONOK
                24500
                                ĊР
                                         GEBTOK
                                                           ON GOSUE?
4570 PE91
                                         Z , PRONOK
                                                           YES, OK
457P 2886
                2455B
                                JR
                                         Z, PRONOK
 4581 PE2C
                                                           COMNA?
                                CP
                24600
 4583 2882
                                                           YES, OK
                24658
                                JR
                                         PRCSON
                                                           HEXT BYTE
 4585 18ED
                24799
                                JR
 4587 CD8C45
                24759 PRONDK
                                CALL
                                         PRCSGG
                                                           PROCESS AS GOTO/GOSUB
                24800
                                JR
                                         PRCSON
                                                           HEXT BYTE
 458A 18E8
                24858
                                                                                                   Program continues
```

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```
24900 ; PROCESS A GOTO OR GOSUB: CHANGES LABELS TO LINE NUMBERS 24950 ; ENTRY: BL POINTS TO BYTE BEFORE PIRST CNARACTES OF LABEL OR LINE NUMBER 25000 ; EXIT: NL POINTS TO NEXT BYTE TO BE CHECKED (BY CHECK) FORGOTO, GOSUB, ETC.
458C D7
                25050 PRCEGG
                                          198
                                                             NEXT BYTE
                                 RST
458D D8
                25100
                                 RET
                                          C
                                                             NUMBER
458E 2002
                25150
                                          NZ, PRCSG2
                                 JR
                                                             : LABEL
4598 2B
                25200 PRCSG1
                                 DEC
                                          HL
4591 C9
                25250
                                 RET
4592 FE2C
                25300
                       PRCSG2
                                 СP
                                                             : COMMA?
4594 28FA
                2535₿
                                 JR
                                          Z, PRCSG1
                                                             :YES
                                                              PROCESS A LABEL
4596 CD9A43
                25488
                                 CALL
                                          LNLBL
4599 23
                25458
                                 INC
                                                             LINE
                                          NL
459A 23
                25500
                                                                 NUMBER
                                 INC
                                          NL
459B
                25550
                                 INC
                                          ВL
                                                                   OF
459C 5E
                25600
                                 LD
                                          E, (RL)
                                                                       ROUTINE
459D
                25650
                                 INC
                                                                         TO
                                          HL
                25790
459E 56
                                          D, (HL)
                                 LD
459F CDAD45
                25750
                                 CALL
                                          PNDLNE
                                                             FOUND A LIRE
45A2 Ø8
                                                             RESTORE FLAG
                                          AF, AF'
45 A3 DØ
                25858
                                 RET
                                                              , LIKE POINTERS DK
45A4 D9
                25900
                                 EXX
                                                             SAVE REG'S
45AS FDES
                25950
                                 PUSR
                                          IY
                                                             ADDRESS OF
45A7 D1
                26000
                                 PDP
                                          DE
                                                                LINE TO DE
45AB CDFC1A
                26958
                                 CALL
                                          1APCH
                                                              WHITE NEW LINE POINTERS
45AB D9
                26199
                                 EXX
                                                              RESTORE REGISTERS
45AC C9
                26150
                                 RET
                26200
45AD CD0646
                26250 FNDLNE
                                 CALL
                                          BINDEC
                                                              ; CONVERT TO DECIMAL
45BØ CDBA45
                26300
                                                              : ADJ. SPACE IN PROG.
                                 CALL
                                          SPACE
4583 88
                26350
                                 ΕX
                                                              SAVE FLAG
                                          AF,AF
45B4 CDF545
                26499
                                 CALL
                                          WRNUN
                                                              IWRITE DECIMAL NUMBER
45B7 EB
                26450
                                 EΧ
                                          DE, BL
45B8 28
                26598
                                 DEC
                                          HL.
                                                             RL POINTS TO END LINE
4589 C9
                26550
                                 RET
                26699
                26650
                       ; SPACE: NOVES PART OF BASIC PROGRAN IN RAN TO ALLOW A LINE NUMBER TO BE
                                 WRITTED IN PLACE OF A LABEL.
                26799 :
                26750
                       PENTRY: ADDRESS OF SOURCE LABEL IN (SRLBPT)
                       ; LENGTH OF ASCII REPRESENTATION ON LINE NUMBER IN (LENDEC); EXIT: CORRECT AMOUT OF 'SPACE' IN PROGRAM TO WRITE LINE NUMBER.
                26888 ;
                26850
                                 CARRY SET IF NEW LINE POINTERS NUST BE WRITTEN
LD BL, (SRLBPT) ; POINT TO SOURCE LABEL
                26 900
45BA 2A6B46
                26 950 SPACE
45BD CD6644
                27000
                                 CALL
                                                              COUNT STRING
                                          LENSTH
45CB 3AD34B
                27050
                                 LD
                                          A, (LENDEC)
                                                              LENGTH ASCII REP.
45C3 BØ
                27100
                                 CP
                                          В
                                                              COMPARE TO LEN.STRING
45C4 C8
                27150
                                 RET
                                                              SAME
45C5 00
45C6 EB
                27288
                                 EΧ
                                                              BAVE FLAG
                                 EX
                                          DE, HL
                                                              END STRING TO DE
45C7 48
                27388
                                 LD
                                          C,B
                                                              COUNT TO
45CB AF
                27350
                                 XDR
                                                                 BC &
45C9 47
                27489
                                 LD
                                          B,A
                                                                  CANCEL CARRY
                                          NL, (ECLRPT)
45CA 2AF940
                27450
                                 LD
                                                              POINT BL TO VARIABLES
                27500
45CD E5
                                 PUSH
                                          BL
                                                              NUMBER BYTES TO MOVE
TO STACK, RESTORE BL
45CE ED52
                2755A
                                 SBC
                                          HL,DE
45D0 E3
                27600
                                 EX
                                           (SP),HL
45D1 00
                27650
                                                              RESTORE FLAG
                                 EX
                                          AF, AF'
45D2 300F
                                          NC, INCSP
                27799
                                 HT.
                                                              NEED MORE SPACE IN PROG.
                       DECREASE SPACE IN BASIC PROGRAM
                27750
45D4 2A6B46
                27888 DECSP
                                 LD
                                          NL, (SRLBPT)
                                                             POINT TO SOURCE LABEL
                                                              LENGTE ASCII REP. TO BC
45D7 4F
                27850
                                 LD
                                          CAA
                                                              DESTINATION TO DE
45D8 09
                27989
                                 ADD
                                          NL,BC
45D9 EB
                                                              SOUNCE TO HL BYTES TO MOVE TO BC
                27950
                                 EΧ
                                          DE.NL
                                 POP
45DA Cl
                28000
45DB EDB0
                20050
                                 LDIR
                                                              MOVE & DELETE
45DD ED53F949
                28188
                                           (SCLRPT), DE
                                                              NEW SCALAR POINTER
                                 LD
                                                              SET CARRY
45El
                20150
                                 SCF
45E2 C9
                28288
                                 RET
                28250
                       ; INCREASE SPACE IN BASIC PROGRAM
                                 PUSH
45E3 E5
                28398
                       INCSP
                                          нL
                                                              ; SAVE VARIABLE POINTER
45E4 91
                28350
                                 SUB
                                          C
                                                              NUMBER OF SYTES TO ADD
45E5 4F
                28489
                                 I.D
                                           C.A
                                                                 TO BC
                                 ADD
                                                              :DESTINATION
45E6 09
                28450
                                          HL, BC
45E7 CD6C19
                20500
                                 CALL
                                           196CH
                                                              ENOUGH RAN?
                 28550
45EA 22F940
                                 ĻD
                                           (SCLRPT), NL
                                                              NEW SCALAR POINTER
45ED EB
                28600
                                 ĒХ
                                                              DESTINATION TO DE
                                           DE, BL
45EE E1
                 28658
                                 PDP
                                          NL
                                                              : SDURCE TO HL
45EF Cl
                                                              BYTES TO NOVE TO BC
                 28700
                                 POP
                                           BC
45FØ Ø3
                 28750
                                 INC
                                                              FUDGE FACTOR
45Fl EDBB
                 20000
                                                              ; MOVE, MAKE ROON IN PROG
                                 LDDR
45F3 37
                 28 85 8
                                                              : SET CARRY
                                 SCF
45F4 C9
                 20900
                                 RET
                 20950
                 29888 ; WRITE NUMBER: WRITE ASCII DECIMAL REPRESENTATION OF LINE NUMBER IN BASIC PROG.
                 29050 JENTRY: NUMBER OF BYTES IN NUMBER IN (LENDEC)
                 29190 ;
                                 ABCI REP. OF NUMBER IN BUFFER POINTED TO BY (DECPTR)
                 29150
                                 ADDRESS WHERE NUMBER TO BE WRITTEN POINTED TO BY (SRLBPT)
45F5 0600
                 29200 WRNUM
                                 LD
                                          B,00
                                                              ; INTIALIZE COUNTER
45F7 21D340
                 29250
                                 LD
                                           HL, LENDEC
                                                              POINT TO BUFFER
```

Program continues



SUPER-SDRT I - Sort, mergs, selrect bility as abso-late executable program or linkable module in Nico-soft formal Sortal sized or verable records with data in binary. 6CD, Packed Decimal, E6CDIC, ASCII, floating & fixed point, esponential, lied iqualitied etc. Even verable number of fields per racord. \$225/825

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gram only

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Pesitioning
WORD-STAR Customization Notes — For applicational
users who do not have one of the many standard
terminal or pinter configurations in the distribution
version of WORD-STAR

WDRD-MASTER Text Editor – In one mode has auper-set of CP/M's ED commands including global seatch-ing and repfacing, florwards and backwards in title in videa mode, provides full screen editor for users with serial addressable-cursor terminal \$150/\$25

FLDPPY BAYER - Protection for center hates of and 6° libopy disks. Drily 1 needed per diskstits to contains centering beet pressure fool and or 7 mil myles i shifocom grings for 25 diskstites.

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9 18, 5°, Rings only 9 18, 5°, Rings o

DESPOOL — Allows flexibility and efficiency. IDisk file printing can be accomplished white aimulataneously using the computer for other basks! Slower printers do not file up the computer. Requires \$25 \text{ minimum.} \text{ \$25.6\$ \text{ minimum.} } \text{ \$25.6\$ \text{ minimum.} } \text{ minimum.} \text{ \$25.6\$ \text{ minimum.} } \text{ minimum.} \text{ minim

MAC — Disk-based, powerful mecro seaem bler utilizes Standard Intel Mnemonics. In

(M)

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You can run simultaneous editors, program translators, and background printer spoolers. Or you can use MP/M for data entry or data-base access from remote ter-minals. Or you can use MP/M realtime teatures to monitor an assembly line and automatically schedule programs for execution throughout the day. MP/M makes an excellent focal point for a cluster of connected microcomputers. The possibilities are limitless.

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(M) Modified version available for use with CPM as implemented on Heath and TRS-90 Model 1 computers.

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quality featible product, and
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Numbricus examples are employed throughout his first PASCAL is used as a vehicle to feach various aspects of programming
lectriques.

```
45PA 4E
                 29300
                                  LD
                                            C, (HL)
                                                           ; ;LENGTH ASCII REP.TO C
45FB 23
                 29350
                                  INC
                                            NL
                                                               ; ADDRESS OF
                                           E, (HL)
45FC 5E
                 29400
                                  LD
                                                                  ASCII REP.
45FD 23
                                  INC
                 29450
                                            HL
                                                                    TO
                                           D, (NL)
45FE 56
                 29500
                                  LD
                                                                        DE
45FF 2A6B46
                                            NL , (SRLBPT)
                                                               POINT TO SOURCE LABEL
                 29550
                                  LD
4602 EB
                 29600
                                  EX
                                            DE, HL
4603 EDB0
                 29650
                                  LDIR
                                                               ;WRITE ASCII REP.DF #
4685 C9
                 29700
                                  RET
                 29750
                 29000 ; BINARY TO DECIMAL: CONVERT INTEGER IN BINARY TO ASCII DECIMAL REPRESENTATION. 29050 ; SAVE ASCII REP. IN BUFFER, COUNT LENGTH
                 29900 ; ENTRY: NUMBER IN DE
29950 ; EXIT: ASCII REP. IN BUFFER POINTED TO BY (DECPTR), LENGTH IN (LENDEC)
4606 EB
                 30000 BINDEC
                                 EX
                                           DE, HL
                                                               ; DN ENTRY DE=#
46B7 CD9AØA
                 30050
                                  CALL
                                            ØA9AN
460A AF
                 30100
                                  XOR
46BB CD3418
                                            1034H
                 30150
                                  CALL
460E B6
                 30200
                                  DR
                                            (NL)
                                  CALL
INC
460F CDD90F
4612 23
                 30250
                                            @FD9N
4613 22D440
                                            (DECPTR), HL
                 30350
                                  LD
                                                               ; SAVE LOCATION ASCII REP.
4616 CD6644
4619 70
                 30400
                                  CALL
                                           LENSTR
                                                               COUNT ASCIT REP.
                 30450
                                  LD
                                            A,B
                                                               SAVE
461A 32D34Ø
                 30500
                                            (LENDEC), A
                                  LD
                                                               ; LENGTH
461D C9
                 30550
                                  RET
                 30600
                 30650 ; FINDS AND DISPLAYS LINE WITH LABEL IN BASIC PROGRAM.
30700 ; CALED BY COMMAND FIND 'ROUTINE NAME'
30750 FINDER CALL LNLBL ; FIND LABEL
461E CD9A43
4621 CD4646
                 30000
                                  CALL
                                            PRLNE
                                                               ; PRINT LINE WITH LABEL
4624 C3B646
                 30850
                                  JP.
                                            READY
                 30900
                 30950 ;LLIST ALL LINES WITH LABEL IDENTIFIER 31000 LLISTR LD A,01
4627 3E01
                                           A,01
(409CH),A
4629 329C40
                 31050
                                  LD
                 31100
                 31150 ; LIST ALL LINES NITH LABEL IDENTIFIER
                 31200 LISTER LD
                                                               ; POINT TO BEG.BASIC PROG. ; LABEL IDNT.IS SEARCH REY
462C ED5BA440
                                           DE, (SPRPTR)
4630 ØECF
                 31250 LISTEL
                                            C, LBIDNT
                                 LD
4632 CD3344
                 31300
                                  CALL
                                           FNDKEY
                                                               ; FIND LINE
4635 B7
                 31350
                                  OR
                                                               ; END PROG?
4636 CAB646
                 31400
                                  JP
                                            Z, READY
                                                               :YES
4639 D5
                 31450
                                  PUSN
                                           DE
                                                               ; SAVE
463A DDES
                 31560
                                  PUSN
                                            IX
                                                               ; BEG. LINE
463C El
                 31550
                                  POP
                                            HL
                                                                  TO HL
463D CD4646
                 31600
                                  CALL
                                                               PRINT LINE
                                            PRLNE
4640 CD9B1D
                 31650
                                  CALL
                                           1D9BH
                                                               :BREAR DR SHIFT@ ?
4643 Dl
                 31700
                                  POP
                                           DE
                                                               ; RESTORE
4644 10EA
                 31750
                                           LISTE1
                                                               ;DO IT AGAIN
                 31800
                 31856 ; PRINT LINE: PRINTS A LINE OF THE BASIC PROGRAM
                 31900 ; ENTRY: IX POINTS TO LINE
4646 DD6E02
                 31956 PRLNE
                                  LD
                                           L, (IX+2)
                                                               ;LINE
                                                               ; TO HL
4649 DD6683
                 32000
                                  LD
                                            H,(IX+3)
                                                               ; ENABLES "." AS CURRENT LINE
; ADDRESS OF LINE
464C 22EC40
                 32050
                                  LD
                                            (40 ECH) , BL
464F DDE5
                 32100
                                  PUSH
                                            IX
4651 CDAFØF
                 32150
                                  CALL
                                            ØFAFN
                                                               DISPLAY LINE #
4654 3E20
                 32200
                                  LD
                                            A,20H
                                                               ; SPACE
4656 CD2A03
                 32250
                                  CALL
                                            032AN
                                                               ; DI SPLAY
4659 E1
                 32300
                                  POP
                                           NL
                                                               POINT TO LINE
                                  INC
465A 23
                 32350
                                           HL.
                                                               ; POINT
465B 23
465C 23
                 32400
                                  INC
                                           HL
                                                               ; TO
                 32458
                                  INC
                                           HL.
                                                                    TEXT
465D 23
                 32500
                                  INC
                                           NL
                                                               ; NRITE TO BUFFER ; POINT TO BUFFER
                                           2B7EN
465E CD7E28
4661 2AA740
                 32550
                                  CALL
                 32600
                                           NL, (BUFPTR)
                                  LD
4664 CD752B
4667 CDFE20
                                  CALL
                 32650
                                            2875N
                                                               :DISPLAY
                 32700
                                  CALL
                                                               : ADVANCE CURSOR
                                            20 FEH
466A C9
                 32750
                                  RET
                 32800
466B 0BBB
                 32650 SRLBPT DEFW
                                            4000B
                                                               :SAVES ADD. SOURCE LABEL
                 32900
                 32950 ; WORD LIST: HOLD LIST OF WORDS RECOGNIZED BY LABEL.
                 33000 :LIST LOORS NIERD SECAUSE OF IMBEDDED TOKENS (ROUT = R + DUT TOKEN, ETC.)
466D 00
                 33050 NRDLST
                                 DEFB
                                           00
466E 42
                                            BASIC'
                 33100
                                  DEFM
4673 00
                 33150
                                  DEFB
                                            00
4674 B6
                 33200
                                  DEFB
                                           DELTOK
4675 9C
                 33250
                                  DEFB
                                           LNETOK
                 33300
4676 93
                                  DEPB
                                           REMTOK
                 33350
4677 00
                                  DEPB
                                            00
4678 B4
4679 52
                 33400
                                           LSTTOR
                                  DEFB
                 33450
                                  DEFB
467A A0
467B 00
                                           OUTTOK
                 33500
                                  DEFB
                 33550
                                  DEFB
                                            00
467C 46
                 33600
                                  DEFM
                                            'FIND'
4600 0B
                 3365B
                                  DEFB
4681 B5
                                            LLSTOK
                 33700
                                  DEFB
4682 52
                 33750
                                  DEFR
                                            R
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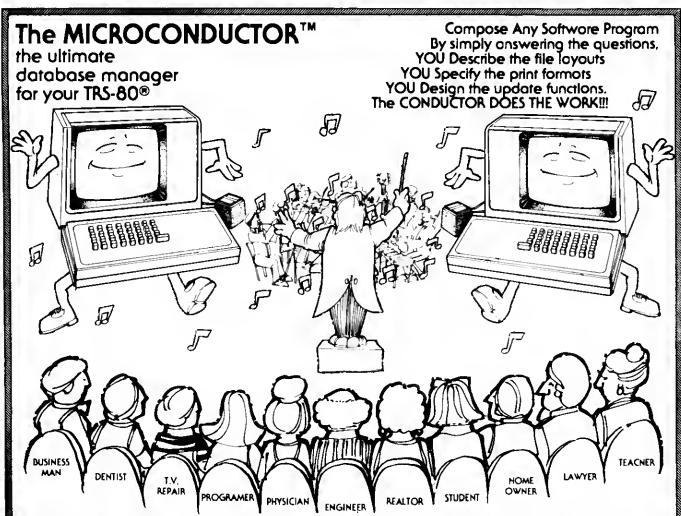
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4684	A B	33666		DEFB	OUTTOR	
	00	33858		OEFB	00	
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		33950	•1.0C8 **T	N OF BC	******************************	NDING TO WORD LIST
4686	AD44		JMPTBL		NOMENU	ADING TO MORD LIST
	OB44	34100		DEFW	ENTLBL	
	F 244	34150		DEFW	DELREM	
	2C46	34200		DEFW	LISTER	
	1E46 2746	34250 34360		DEFW DEFW	PINDER LLISTR	
4030	2140	34350		DUIN	DD 10.1	
	219F46	34400	LBLERR		HL, LBERMS	;LABEL ERROR MESSAGE
	COA7 28	34458		CALL	DISSTR	
4698	32E140	34500 34550		KOH LD	A (40E1H),A	TUHH DFF AUTO
	C3B6 46	34600		JP	HEADY	, TOBB DIT ACTO
		34650				
469F			LBERMS		'ERHOH, LABEL	ASSIGNED'
46B4 46B5		34750 34008		DEFB OEFB	86 80R	
4003	00	34858		OLLB		
		34900				NCLUDED TO HAINTAIN
						TO BE OFFERED BY INSTANT
						H TO SET (INTFLG) TO RUN
					NTERUPTS ON OH C	'CNDLBL' AND 'NOMEHU'.
						EING MODIFIED, THE
		35200	; INTER	UPTS SHO	OULD BE OFF, HOW	EVER, PEOPLE CALL
						N THAT THEIR CLOCK
		35350	; LOSES	TIME !	ī	
46B6	CDBC46		READY	CALL	INTON	;EI ?
	C3191A	35450		JP	1A19H	JJP TO READY
		35500				
46BC	3AD#46	35600	INTON	EX LD	AF,AF' A,(INTFLG)	
46CØ		35650		OR	A, (1011120)	
	280B	35700		JB	z, intex	
46C3		35750		EI		
	1800	35000		JH	INTEX	
46C6	3ADØ46	35966	INTOFF	LD	AF, AF' A. (INTPLG)	
46CA		35956		OH	A, (INTERIO)	
	2601	36000		JR	Z, INTEX	
46CD		36050		DI		
46CE		36150	INTEX	EX RET	AF, AF'	
46CF	C3	36200		REI		
		36250				
46D#	00	36300	INTPLG	DEFB	88	
46D9	00	36300 36350	INTPLG	DEFB	88	
46D#	00	36360 36358 36488			00 UPT CBECK AND SE	T ROUTINES
46D9	00	36360 36350 36400 36450 36504				T ROUTINES
46D#	99	36360 36350 36400 36450 36500 36550	; END C	e inter	UPT CBECK AND SE	
46D#	••	36360 36400 36450 36500 36550 36600	; END C	F INTER	UPT CBECK AND SE	HITIALIZATIOH
46D#	••	36360 36350 36450 36450 36550 36650 36650 36650	; END O ; IHITIA ; NOTE ; PROTE	F INTER	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW *	HITIALIZATION ON ROUTINE IS DESIGNED TO
46D9		36360 36350 36400 36450 36550 36550 36650 36650 36750	; END O ; IHITIA ; NOTE ; PROTE	F INTER	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO	IHITIALIZATIOH
		36368 36458 36458 36506 36506 36688 36658 36758 36758	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE	UPT CBECK AND SE OT SAVED AFTER I IS INITIALIZATIO L IN * LOW * HIGE NEMORY.	INITIALIZATION ON ROUTINE IS DESIGNED TO MEMORY. CBANGES MUST BE
46D1	21C441 11F642	36368 36458 36458 36558 36558 36688 36768 36768 36768 36768	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N iii TH CT LABE TO USE	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW * HIGE NEMORY. HL,BLHRAM	INITIALIZATIOH OH ROUTINE IS DESIGHED TO MEMORY. CBANGES HUST BE ; POINT TO RAM
46D1 46D4 46D7	21C441 11F642 8683	36368 36458 36458 36506 36506 36688 36658 36758 36758	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE	UPT CBECK AND SE OT SAVED AFTER I IS INITIALIZATIO L IN * LOW * HIGE NEMORY.	INITIALIZATION ON ROUTINE IS DESIGNED TO MEMORY. CBANGES MUST BE
46D1 46D4 46D7 46D9	21C441 11F842 6683 CDP746	36300 36358 36458 36558 36558 36658 36758 36758 36888 36988 36988	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: NITER	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIC L IN * LOW * HIGH MEMORY. HL,BLHRAM DE,EXBLN 3,3 EXCNHG	INITIALIZATIOH OH ROUTINE IS DESIGHED TO MEMORY. CBANGES MUST BE ; POINT TO RAM ; POINT TO BYTES IN PROC.
46D1 46D4 46D7 46D9 46DC	21C441 11F842 8683 CDF746 21B241	36360 36450 36450 36500 36500 36650 36650 36740 36750 36950 36950 37950	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE LD LD LD CALL LD	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW * HIGE NEMONY. HL,BLHRAM DE,EXBLN 2,3 EXCNHG HL,FSTRAM	HITIALIZATIOH OH ROUTINE IS DESIGHED TO MEMORY. CBANGES MUST BE ; POINT TO RAM ; POINT TO BYTES IN PROC. ; HO.BYTES TO EXCHANGE
46D1 46D4 46D7 46D9 46DC	21C441 11F042 9603 CDF746 21F241 11B244	36360 36450 36450 36500 36550 36650 36750 36750 36750 36950 36950 37900 37900	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE LD LD LD CALL LD	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW * HIGE MEMOHY. HL,BLHRAM DE,EXBLN 3,3 EXCHIG HL,FSTRAN DE,EXCHIDL	HITIALIZATIOH OH ROUTINE IS DESIGHED TO MEMORY. CBANGES MUST BE ; POINT TO RAM ; POINT TO BYTES IN PROC. ; HO.BYTES TO EXCHANGE
46D1 46D4 46D7 46D9 46DC 46DF	21C441 11F842 8683 CDF746 21B241	36360 36450 36450 36500 36500 36650 36650 36740 36750 36950 36950 37950	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE LD LD LD CALL LD	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW * HIGE NEMONY. HL,BLHRAM DE,EXBLN 2,3 EXCNHG HL,FSTRAM	HITIALIZATIOH OH ROUTINE IS DESIGHED TO MEMORY. CBANGES MUST BE ; POINT TO RAM ; POINT TO BYTES IN PROC. ; HO.BYTES TO EXCHANGE
46D1 46D4 46D7 46D9 46DC 46DF 46E2 46E4 46E7	21C441 11F042 9603 CDF746 21B241 11B244 9603 CDF746 21D146	36368 36458 36458 36584 36586 36658 36658 36748 36758 36908 37988 37988 37158 37158 37158 37258	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE LD LD LD LD LD LD LD LD LD LD LD LD LD	OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW * HIGH MEMORY. HL,BLBRAM DE,EXBLN 3,3 EXCNHG HL,FSTRAM DE,EXCMDL B,03 EXCNHG HL,IHIT	HITIALIZATIOH ON ROUTINE IS DESIGNED TO MEMORY. CBANGES MUST BE ; POINT TO RAM ; POINT TO BYTES IN PROC. ; HO.BYTES TO EXCHANGE ; EXCBANGE ; POINT TO INIT. ROUT.
46D1 46D4 46D9 46D0 46D0 46E2 46E2 46E7	21C441 11F042 9603 CDF746 21B241 11B244 9603 CDF746 21F146 3600	36360 36450 36450 36550 36650 36650 36760 36750 36950 36950 37950 37150 37150 37250 37300	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N 111 TH CT LABE TO USE LD LD LD LD LD LD LD LD LD LD LD LD LD	UPT CBECK AND SE OT SAVED AFTER 1 IS INITIALIZATIO L IN * LOW * HIGH MEMOHY. HL,BLHRAM DE,EXBLN 3,3 EXCNHG HL,FSTRAN DE,EXCMDL B,83 EXCNHG HL,IHIT (HL),86	HITIALIZATIOH OH ROUTINE IS DESIGHED TO MEMORY. CBANGES MUST BE ; POINT TO RAM ; POINT TO BYTES IN PROC. ; HO.BYTES TO EXCHANGE ; EXCBANGE ; POINT TO INIT. ROUT. ; WILL BE START
46D1 46D4 46D7 46D9 46DF 46E2 46E4 46E7 46EA	21C441 11F042 9683 CDF746 21B241 11B244 9683 CDF746 21D146 3688 23	36360 36450 36450 36550 36550 36650 36750 36750 36950 37950 37150 37150 37250 37350	; IHITIA ; NOTE ; PROTE ; MADE	LIZE: N III TH CT LABE TO USE LD LD LD LD LD LD LD LD LD LD LD LD LD	OT SAVED AFTER I IS INITIALIZATIO L IN * LOW * HIGH NEMORY. HL,BLHRAM DE,EXBLN 3,3 EXCNHG HL,FSTRAM DE,EXCMDL B,83 EXCNHG HL,IHIT (FL),86 NL	HITIALIZATIOH ON ROUTINE IS DESIGHED TO MEMORY. CBANGES MUST BE ;POINT TO RAM ;POINT TO BYTES IN PROC. ;HO.BYTES TO EXCHANGE ;EXCBANGE ;POINT TO INIT.ROUT. ;WILL BE START ; OF BASIC PROGRAN
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For a few bucks and a couple hours of time you can put together a joystick, or paddle control, that plugs into your TRS-80 cassette port.

The joystick is a tool that converts variable resistances to digital signals, giving you new freedom in controlling family games. Beyond games, you can use this same, simple hardware/software combination to make your TRS-80 into a two-channel recording thermometer, e proximity sensor, a solar flux/light level meter or two ohmmeters.

All this is done with a 35 cent chip, a few resistors and some capacitors.

Joyatick Fundamentals

The joystick is an enalog sensor that produces varying resistances.

I'm going to be using the word joystick throughout this article to describe anything that produces measurable resistences.

The basic point about joysticks is that they have two varieble resistors or "pots" (potentiometers). Following normal electronic's usage, these pots are called R1 and R2. Both pots are hooked up to the control stick by a small mechanism. Because of this mechanism, when you swing the joystick left or right, only one of the pots increases or decreases its resistance.

When you move the stick forward or backward, the other pot's rasistance is changed. When you move it diagonally, both pots change. To interface a joystick to your TRS-80 your

computer must be able to distinguish R1 and R2. We'll use a 555 oscilletor and en algorithm.

The Hardware

To make the interface there's only one fact you need to know about the 555 oscillator: It puts out a square wave es shown in

Fig. 1.

The duration of high and low parts of the square wave are controlled by two resistors, R1 and R2, also shown in Fig. 1. The oscillator will be low for a length of time which is proportional to R1. Then it will be high for a time proportional to R1 + R2.

Fla. 1

```
REM CALL JOYSTICK INPUT SUBROUTINE
10 GOSUB 900
20 PRINT00,DE,DP
25 REM SET THE JOYSTICK'S POINT ON THE SCREEN
30 X=DE:Y=DP
40 RESET(X0,Y0):SET(X,Y):X0=X:Y0=Y
50 GOTO 10
875 REM
665 REM JOYSTICK INPUT SUBROUTINE 695 REM WAIT FOR A TRANSITION
900 GOSUB 1000
905 REM MEASURE TIME TILL NEXT TRANSITION AND STORE IN
918 GOSUB 1888
915 REM MOVE DE TO DP AND MEASURE TIME TILL NEXT TRANSI
920 COSUB 1800
925 REM MAKE SURE DE HAS THE LAPCER OF DE AND DP 926 REM SWAP 'EM IF MECESSARY
     IF DE<DP THEN TM=DE: DE=DP: DP=TM
940 DE=DE-DP
    REM VOILA! DE IS PROPORTIONAL TO R2, DP TO R1
950 RETURN
985 REM
995 REM MOVE DE TO DP
1888 DP=DE
1005 REM ZERO THE COUNTER .
1010 DE=0
1015 REM RESET CASSETTE INPUT FLIP~FLOP 1020 OUT 255,0
1025 REM INCREMENT COUNTER
1939 DE=DE+1
1935 REM
           READ IN PORT 255
1040 A=INP(255
1045 REM MASK OFF BIT 7
1050 A=A AND 120
1955 REM IF BIT 7=9 THEN LOOP BACK. OTHERWISE RETURN
1960 IF A=9
1970 RETURN
     IF A=8 GOTO 1838
          Program Listing 1. The BASIC Algorithm
```

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```
REM LOAD MACRINE LANGUAGE ALGORITHM
18 AD=20223:FOR I=1 TO 51:READ A:POXE AD+I,A:MEXT
15 REM SET UP TRS-80 POINTER TO CALL MACHINE LANGUAGE A
26 POKE 16526,4:POKE 16527,79
385 REM...
398 REM.
395 REM ROUTIME TO CONVERT JOYSTICK TO DIGITAL THEN PRI
396 REM AND DISPLAY THE POINT
400 CLS:AD=20226:O=256:YM=.290:XM=.59
405 REM A WILL BE PROPORTIONAL TO R1. B TO R2.
      A=USR(0):B=PEEK(AD)+Q*PEEK(AD+I)
420 PRINTES,A,B
424 REM SCALE X AND Y VALUES BEFORE PLOTTING
     X=XH*A:Y=YH*I
427 REM MAKE SURE X AND Y AREN'T TOO LARGE FOR SET(X.Y)
420 IF Y>47THEN Y=47
429 IP X>127THEN X=127
     RESET(X#,Y8):SET(X,Y):X#=X:Y#=Y:COTO 418
985 REM...
998 REM.
995 REM THE MACHINE LANGUAGE ROUTINE IS CONTAINED IN TH
996 REM DATA STATEMENT
18M8 DATA B,8,8,8,205,36,79,285,36,79,285,36,79,213,217,225,237,82,56,1,217,213,217,225,237,82,34,2,79,235,34,8,79,195,154,18,217,175,211,255,17,8,8,19,219,255,230,1
Program Listing 2. To Load the Machine Language Algorithm
```

The high and low durations can be input to the TRS-80 by using the cassette input plug. An alternative procedure is to use the expension connector in the rear of the TRS-80, but this approach would turn our one-night one-chip project into a week long multi-chip wire-wrap mess.

Using the cassetta port is safe because the input is coupled by capacitors to the computer. This means you can mess up and dump a ±9 volt DC signal into the input and not worry about roasting the components.

Fig. 2 is a circuit diagram illustrating the interfece of the 555 oscilletor to the cassette input port. The left side of the figure is the oscillator you'll build. The right side of the

diagram represents the perts of the TRS-80 which are important to the interface. A more complate (completely confusing?) diagram is shown in the back of the TRS-80 Microcomputer Technical Reference Manual.

Cassetta Port Explained

Consider the diagram of the TRS-80 in Fig. 2, Low level voltage pulses antering your computer through the cassetta ear jack go into the signal conditioner.

This conditionar converts thase pulses (ebout 0.2 voits) or alther polerity into pulses which can SET the flip-flop. For example, if the output is 0, then the pulse makes it a 1. If the output is 1, it stays 1.

L2 00 00 Scratchoad to R1 and R2 1.3 00 00 CALL LOOP t.1 CALL LOOP Collect data from cassetta port. CALL LOOP Store in DE and DE' PUSH DE EXX Find which of DE, OE' is larger POP HL SBC DE JR C, LA Put the larger in HL, smaller in OE. EXX PUSH OE Subtract DE from HL. Then DE has R1, LA HL has R2. **EXX** POP HI SRC OF LDS (L3), HL Store R1 and R2 in scretchpad. EΧ LO (L2), HL JP GABAH LOOP EXX XOR A Initialize timing loop-Swap DE, DE'; **OUT FF** Reset flip-floo; zero counter LD DE. 00 00 INC OF LE IN FF Timing loop AND BOH JR Z, LE RET

Program Listing 3. Machine Language Algorithm with Functions Explained

Fig. 2 also shows some bipoler pulses which will SET the flip-flop.

The output of this flip-flop can be read as the eighth bit of a data word. We will read this whenever an INP(255) BASIC function, or its machine language equivalent, is executed. The path of data into your machine begins at the cassette jack, moves to the signal conditioner, to the flip-flop end to port 255 where it's read.

it's importent to know that once that filp-flop is SET, it stays SET—until it is RESET.

If you want the computer to be aware of more than one pulse, you must RESET the filpflop each time it is SET. To RE-SET it, send an OUT 255,0 BASIC command or its machine languaga equivalant.

Remamber that the output of the 555 oscillator is controlled by the variable resistors R1 and R2, but this square wave output is not directly into the TRS-80. First it passes through a capacitor which produces bipolar pulses saveral microseconds long on the cassette input port so that every time the 555 oscillator makes a transition, up or down, the flip-flop will be set.

By measuring the time between successive sattings and using an algorithm, we can find R1 and R2 or, rather, generate numbers which are proportioned to R1 and R2.

The Algorithm

Wa'li measura time between

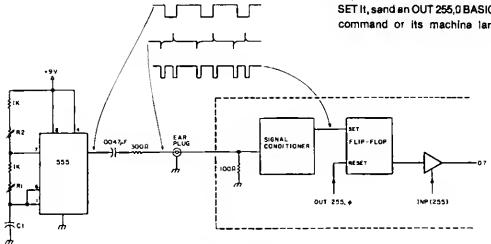


Fig. 2

1 Joystick w/100 K pots
1 555 chips
2 1K resistors
1 0.1 microfarad capacitor
1 1.0 microfarad capacitor
(optional)
1 9-volt battery
1 battery chip
1 miniature phone jeck
1 300 Ω resistor
1 4.7 nF capacitor

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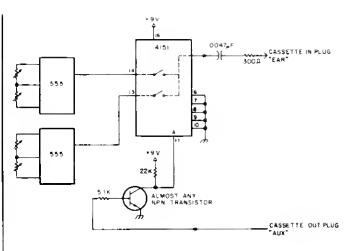


Fig. 3

5 REM LOAD MACHINE LANGUAGE ALGORITHM AND SET-UP USR(0) POINTER 10 AD=20223:TP=16526:FORI=1 TO 51:READ A:POKE AD+I,A:NE XT 15 POKE TP, 4: POKE TP+1, 79 13 FORE 12,41FURE 1741,/9

18 REM MACHINE LANGUAGE ALGORITHM IS IN DATA STATEMENT

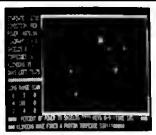
20 DATA 8,0,0,205,36,79,205,36,79,205,36,79,213,217,2

25,237,22,56,1,217,213,217,225,237,22,34,2,79,235,

34,0,79,195,154,10,217,175,211,255,17,0,0,19,219,2

55,230,128,40,249,201 BS REM ... 90 REM... 95 REM...SLALOM GAME FOLLOWS
98 REM Y(I) IS THE VERTICAL LOCATION OF GATE * I
99 REM WE START OFF WITH NO GATES DISPLAYED
188 DIM Y(3),X(3):CLS:N=34:FORI=1TO3:Y(I)=45:NEXT 115 REM BEGIN MAIN LOOP 117 REM DY IS THE V DY IS THE VERTICAL GATE MOVEMENT PER LOOP. THIS IS CONTROLLED BY YOUR JOYSTICK. 118 REN 120 DY=PEEK (AD+3)/48 122 GOSUB 500 130 REM BEGIN GATE MOVEMENT LOOP 139 REM I IS THE GATE INDEX. WE COUNT DOWN IN THIS LOOP 148 REM THE POINTS (J,K) AND (M,K) FORM THE GATE. IF IT 149 REM OFF THE SCREEN THEN WE GOTO 300 TO GET A NEW GA 150 K=Y(I):J=K(I):M=J+10:IF K>43 THEN 300 154 REM GET SKITER'S POSITION. SET HIS LOCATION. 159 REM MOVE GATE # I 160 L=K+DY:Y(I)=L 176 RESET(J,K):RESET(M,K):SET(J,L):SET(M,L)
177 REM SEE IF SKIIER CROSSED THE GATE'S Y-POSITION.
178 REM IF SO THEN GOSUB TO SEE IF HE PASSED THRU THE G 180 IF K<N AND L>N GOSUB400 195 REM NEXT GATE'S INDEX, OR LOOP TO 120 IF WE'VE MOVE 196 REM THE GATES. I>1 FOR 2 GATES. I>0 FOR 3.
208 1=1-1:1F1>0 GOTO 150 210 GOTO120 218 GOTOLZ# 298 REM 1-.98 IS THE PROBABILITY THAT A GATE WILL BE GE NERATED. ADJUST THIS PARAMETER TO SUIT YOURSEL 300 RESET(J,K):RESET(M,K):IF RND(0)<.90 GOTO 200 304 REM NG COUNTS THE NUMBER OF GATES GENERATED 305 NG=NG+I 309 REM GENERATE NEW GATE'S X-POSITION. Y(I)=0:K(I)=117*RND(0):GOTO 200 390 REM SEE IF SKIIER PASSED THRU THE GATE
400 IF S>J AND S<N RETURN
409 REM NM COUNTS 4 OF GATES MISSED. MISS 5 AND YOU'RE DONE. 410 NM=NM+1:IFNM<STHEN:PRINT@0.NM:RETURN 41S REM SCORING ALGORITHM 420 CLS: SC=RND(10000) 428 REM PRINT NOW SKIIER DID 430 PRINT OF GATES, NG 440 PRINT NISSED, NM 450 FORI-1TO1000 NEXT 45S REM PRINT SCORE IN BIG LETTERS
460 CLS:0UT255,0:PRINT"S C O R E = ",SC
470 FOR I=1T03000:NEXT:CLS 490 REM THIS SUGROUTINE READS THE JOYSTICK AND DISPLAYS THE SKIIER'S POSITION.
S00 S=USR(0)/2-15:1FS>127THENS=127 IF S<0 THEN S=0 \$10 RESET(S0,N):SET(S,N):S0=S:RETURN Program Listing 4. Slalom

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L2 00 00 L3 00 00 **CALL LOOP** CALL LOOP CALL LOOP PUSH DE See Program Listing 3 for description EXX POP HL SEC OF JR C, LA EXX PUSH DE EXX POP HL Sec DE PUSH HL LD IX.(L3) Steshes R2 on stack. Averages and stores R1. CALL AVRG LD(L3).HL POP OF LD IX,(L2) Retrieves R2. Averages and stores R2. CALL AVRG LD (L2),HL LD 6.04H LO A,7FH SAL H ARL DJHZ LO Puts the smaller of R2/18 or 127 into HL. Returns HL as the CPL value of the USR(0) function. JR NC. LC LOLA JP 0A9AH LC AVRG PUSH IX POP HL Averaging subroutine. LO 6.03H Divides N by 18. SAL, H L6 AR L DJHZ L8 N/8 - R into HL SEC DE LD A,L IF ABS(N/8 - R)>4 JR C.L7 NEG CP 04 17 JR C, LB THEN GOTO US EX **PUSH IX** ELSE HL = 7/8 · N + R POP HL SEC DE RET **L8** EX LD 6.03H HL = A-8 1.8 SLA,L BB H DJNZ L9 BET LOOP EXX A ROX **OUT FF** Same timing loop as Program Listing 3. LD DE 00 00 LD INC OE IN FFH AHD 80H JR Z. LO

Program Listing 5

```
18 AD=28227:TP=16526:FOR[=ITO115:READA:POKEAD+I,A:NEXT:
           POKETP, 4: POKETP+1,79
POKETP,4:POKETP+1,79

15 DATA 285,184,79,285,184,79,285,194,79,213,217,225,23

7,82,56,1,217,213,217,225,237,82,229,221,42,2,79,2

85,65,79,34,2,79,289,221,42,8,79,285,65,79,34,8,79

,6,4,62,127,283,68,283,29,16,258,189,481,111,195,

154,18,221,229,225,6,3,283,88,283,

24 DATA 16,258,237,82,125,48,2,237,68,254,4,48,7,235,22

1 29,255,237,82,125,48,2,237,68,254,4,48,7,235,22
           1,229,225,237,82,201,235,6,3,283,37,283,24,16,258,281,217,175,211,255,17,4,8,19,219,255,234,128,48,2
            49.281
 149 CLS:Q=256: AD-28224
  145 XM=.85:YM=.82
 118 S-USR(8):X-PEEK(AD-MQ*PEEK(AD+1):Y-PEEK(AD+2)+Q*PEE
           K(AD+3)
126 PRINTEG,S,X,Y:X=XN*X:Y=YN*Y
125 IF X>127 THEN X=127
126 IF Y>47 THEN Y=47
 136 RESET(X8, Y8): SET(K, Y): X4=X: Y8=Y
 146 GOTO 118
```

Program Listing 6. Data statement

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RET

transitions with a timing loop. After locating a transition, zero a counter; RESET the input flip-flop with an OUT 255,0 instruction; and ENTER the loop. The loop is diagrammed in the Flow Chart

When a transition has occurred the counter has a number proportional to either R1 or R1 + R2.

(You're half way. You'll be finished when you store the counter's value; re-zero the counter; RESET the flip-flop; and repeat the loop.)

if you had R1 the first time, this time you'll have R1 + R2 (and vice versa). At this point you have two numbers, and you don't even know which is which. The algorithm takes advantage of the fact that R1 + R2 is obviously larger than R1.

Program Listing 1 is a BASIC form of the algorithm which establishes the joystick's settings. It also PRINTs the numbers proportional to R1 and R2 and displays them as points on the screen.

This BASIC program has one drawback: It's dreadfully slow. To use it, C1 of Fig. 2 has to be large. Ten microfarads is barely enough with 100K pots on the joystick. Even though it's slow, try it before moving on to the machine language version.

Machine Language Algorithm

Program Listing 2 automatically loads a machine language version of the joystick algorithm into memory. The program sets up the appropriate TRS-80 pointer so that when you execute the A=USR(0) function, you will convert the joystick settings.

Type the listing and double check the DATA statement. Since the program's more than 1000 times faster than the BASIC algorithm of Program Listing 1, you'll need to make C1 about 0.1 microfarads.

A, the value returned by A = USR(0), will be proportional to R1. Since USR(0) returns only one value, we've chosen to store the number proportional to R2 as a two-byte integer in locations 20224 and 20225.

8 = PEEK(20224) + 256 * PEEK(20225)

Line 10 of Program Listing 2 recovers R2. If you make C1 equal to 0.1 microferad and put a large resistor (200K to 500K) in parallel with R2, R2 will be less than 255. This meens that the number proportional to R2 is stored entirely in 20224 and the much quicker B = PEEK(20224) will recover it for you.

The rest of Program Listing 2 is a demo which shows you the type of coding you can use to let the joystick move a dot all over your monitor. Note that you'll have to multiply A and B by scale factors to make the full travel of the joystick's dot comparable to the screen size. You may have to juggle these parameters a bit.

Program Listing 3 is an assembly language listing of the algorithm in Z-80 mnemonics, accompanied by an explanation of each function.

Slalom

Program Listing 4 lets you play an arcade-type joystick game on your TRS-80. The object of Slalom is to ski e point through a series of gates which move down from the top of the screen. You move the skier around the screen with the joystick. Moving the joysticks forward or backward controls the speed of the gates.

Since I'm more interested in building and interlacing peripherals than in BASIC programming, I'm sure there's room for you to improve Slalom.

I kind of like Slalom—not only because it demonstrates how to utilize your joystick, but also because it demonstrates a useful way of interfacing a machine language routine with a BASIC program. When you run the game, the first thing the program does is to load the algorithm into memory and set up the USR(0) pointer.

The DATA statement of this figure contains exactly the same algorithm as Listing 2 and 3. When you write your own joystick games you might want to use lines 1 to 20 to start your routine.

The Loophole Algorithm

One problem with increasing the joystick's speed is that we end up with about one percent jitter in its settings. When running Program Listing 2, this jitter causes the point to occasionally hop back and forth on the screen. This causes no trouble for e simple game such as Slalom. But it would cause problems if you were using the joystick to do something more precise, such as manipulate a cursor.

You can eliminate the jitter with an auxiliary algorithm. When you measure A = USR(0), where A is proportional to R1, set:

N = 7/8·N+A

This will make N the running average of the last eight values we measured. N will have little jitter.

The drawback of this averaging technique is that you have to wait while N establishes its new value when you move the joystick and suddenly change A.

To get around this, include a loophole in the software so that when you move the joystick, N will first change rapidly and then start everaging to produce low jitter values. The loophole algorithm is:

IF ABS(N/8 - A)<3 THEN N = .875 • N + A ELSE N = 8 • A

Try this in the routine in Listing 2. You'll have to change line 425 to read X = XM·N before doing the SET(X,Y).

The same technique can be used to eliminate any up and down jitter, too.

If you need to eliminate the jitter and want to do it quickly, use the machine language algorithm of Program Listing 5. This algorithm reads the joystick, finds numbers proportional to R1 and R2 and averages them over the last eight reads. It's just like the BASIC coding, except it's much faster.

Program Listing 6 shows a DATA statement which you can

use to automatically load the algorithm into memory. This algorithm will store the value of N, proportional to R1, as a two-byte integer in locations 20224 and 20225. Following the usual convention, 20224 has the least significant byte and 20225 has the most significant.

The averaged value proportional to R2 is stored in 20226 and 20227. In addition to storing the numbers, when you execute this algorithm with S = USR(0), S will be proportional to R2.

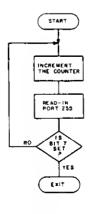
Beyond a Single Joyatick

Fig. 3 is a circuit which lets you use two joysticks. The key trick here is to use the cassette-out plug to select the joystick. We "amplify" and invert the cassette-out signal (OV to 0.9V) with a transistor.

The signal goes into select pin A of a 4051 analog switch. A zero at input A of the 4051 hooks up one of the 555s to the capacitor. A one on A hooks up the other.

To select one joystick, you must issue an OUT 255,2 instruction which puts zero volts on the cassette-out plug. To select the other joystick, you issue an OUT 255,1 instruction. This puts 0.9V on the cassette-out plug. You must do this before calling the algorithm. You must also do this, consistently, within the algorithm.

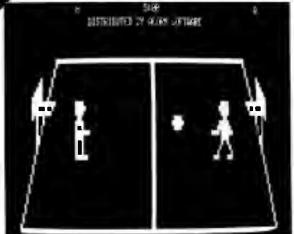
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Flowchart

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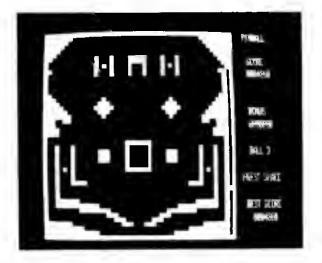
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Speed up your I/O programming with this collection of subroutines and get a robot to boot!

COMPAC

Daniel M. Romanchik KB6NU 4178 Decoro #1 San Diego, CA 92122

This article is not about assembling robots. Not the way you think, anyway. It's all about how to use the assembly language capabilities of your TRS-80 more easily.

One of the more time-consuming jobs of assembly language programming is the I/O.

Below is a description of a collection of subroutines I call "COMPAC", which is short for "communications package".

COMPAC, an assembly of subroutines, displays a byte on the CRT, fetches a byte from the keyboard, displays a message, clears the CRT screen, adds spaces between characters, positions the cursor anywhere on the screen and puts back lines between blocks of text. These routines enable you to better use the keyboard and CRT in your assembly language programs.

At the end of this article is the program which tells about "as-

sembling" a robot on the screen, once the groundwork is down.

Getting Going

CRT, to begin, is the subroutine which displays a byte on the CRT screen (see Listing). To use this, just load the ASCII code for the character you want into the A register, and call CRT. The first thing we do is save the contents of the DE and IY registers by pushing them onto the stack, because we use these registers in CRT. If we didn't, we'd lose the data in the registers.

The next instruction, CALL 33H, jumps to a subroutine in the Level II ROM (CALL works like the GOSUB in BASIC). The byte in the A register la displayed at the cursor, and the cursor incremented. Then, the program returns to our subroutine, and the original values of IY and DE are popped off the stack. The last instruction, RET, returns us to the main program.

The next subroutine, KBSCAN, scans the keyboard. It places the ASCII value of the next key into the A register. KBSCAN returns characters in ASCII, doesn't give numeric values, and returns one character at a time. It requires only one instruction: CALL KBSCAN. When KBSCAN is called, the contents of the DE and IY registers are saved as in CRT.

A Level II routine at 002BH is then called and does most of the

work. It acans the keyboard once, and if any of the keys are pressed, places the ASCII value of the character into the A register. If none are pressed, it returns a value of 00H. When finished with the scan, execution is returned to KBSCAN.

The next two instructions check to see if any of the keys are pressed. CP 0 compares the value in the A register to 00H. If A = 00H (meaning no key was pressed), the Z flag is set to 1. If A <> 00H (one is pressed), the Z flag is reset to 0.

The next instruction, JP Z,AGN, checks the condition of the Z flag, and jumps to the statement labeled AGN if the flag wes set. This sends us back to the scanning routine in the Level II ROM. We loop over and over until somebody hits a key. If the flag is reset (=0) we go to the next instruction, which pops the values of DE and IY off the stack. This routine can be used to stop program execution. It stays in a loop until a key is pressed.

The next subroutine, MES-AGE, displays a message. The programmer must first store the message in memory and keep track of it. Say we wanted to display MY PROGRAM. Store the characters in the message at some known place in memory:

ORG 5000H DEFM 'MY PROGRAM' DEFB 0 We use 00H as our end-of-text character. To print this onto the CRT requires the following steps:

> LD IX,6000H CALL MESAGE

IX is located with the memory location of the first character and then the subroutine is called.

The next instruction gets a character from memory, and puts it in the A register. It is compared to 0. If the value is 0, we are at the end of the string. If not, there is a character to display, and we call the CRT routine to display it.

The next instruction, INC IX, increases the pointer, and JP AGAIN jumps to the beginning of the subroutine to fetch the next character. This time the IX register is pointing to the next character. We repeat these steps until we get to the "0" at the end of the string.

The CLRCRT subroutine is used to clear the screen. First, we load the A register with 1CH, and CALL CRT as if to display this byte. However, when the CRT subroutine sees 1CH, it resets the cursor to the home position. 1FH is then loaded into the A register and CRT is called. 1FH clears the screen from the current position of the cursor to the end of the screen. This subroutine requires one instruction—CALL CLRCRT.

Continue to 203

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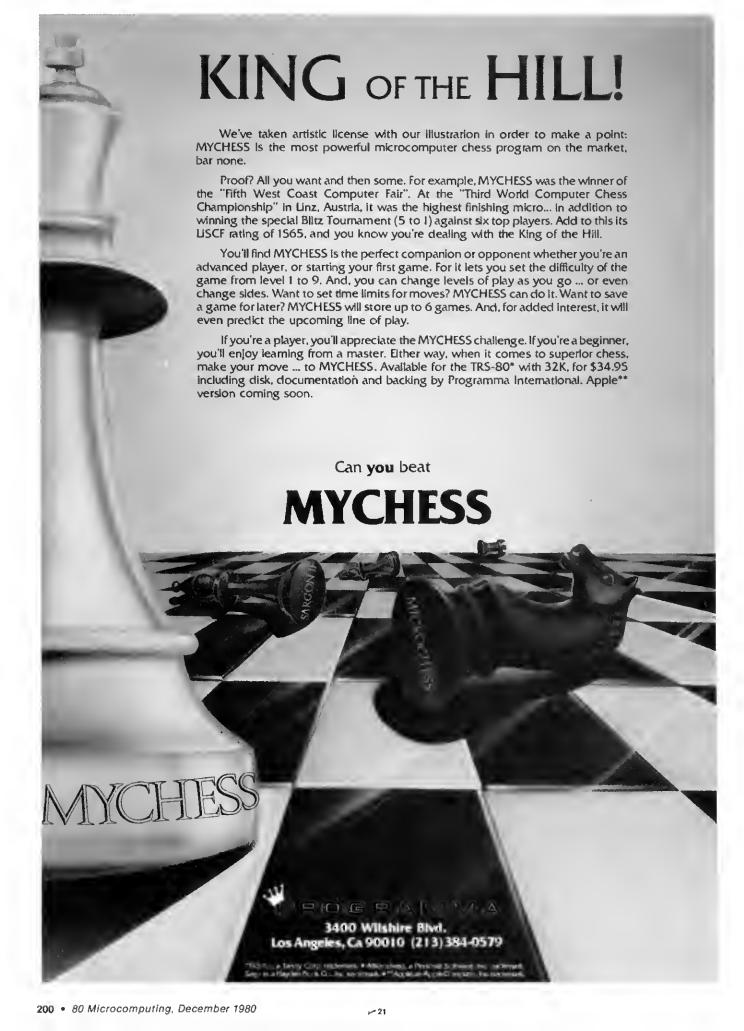
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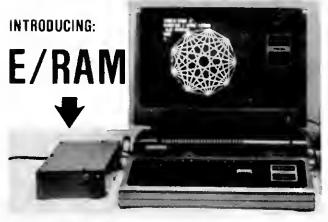
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Sets up display PLOT Plots a point

READ Reads a point from the screen Sets drawing mode to black (off)

BLACK

Sets drawing mode to on WHITE CLEAR

Clears the high-resolution graphics screen Draws a line

As an example, after the utilities package is loaded and you desire to draw a line, the following sequence of BASIC instructions could be executed

> U=USR(0) Return the communications area Provide the beginning X coordinate Provide the beginning Y coordinate POKE U+1,X0 **POKE U-3.YO** POKE U+5.X1 Provide the ending X coordinate POKE U+7, 91 Provide the ending Y coordinate Oraw the line (Current speed is approximately 13 vectors/second)

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SPACES lets you put up to 255 spaces between characters. Do It this way. Load the B register with the number of spaces you want and call SPACES, as in the following:

stack. Return to the main program. Lest Step

LINES is the last subroutine

and places blank lines between text. To get started, load the B register with the number of lines to be inserted. For example, to

place two lines between messages, do this:

> LO B,2 CALL LINES

LD B,10 CALL SPACES

The A register is loaded with 20H, which is the ASCII code for space. Call CRT which displays the space. The next instruction, DJNZ SPACES, does this:

- · Decrements the B register.
- Checks if B equals 0.
- If B is not equal to 0, it jumps to the statement labelled SPACES.
- If B equals 0, it continues. It causes a number of loops, equal to the initial value of the B register, to be executed.

The next subroutine, POSIT, positions the cursor. Load the BC registers with the desired positions, and call POSIT. Try this:

> BC,512 LO CALL POSIT

to place the cursor at position 512. The contents of the HL registers are saved, as in CRT. HL is loaded with the value 3C00H which is the start of the video RAM, or position 0. Next, add BC to HL. Load it into memory location 4020H, 4020H and 4021H contain the cursor position. Restore HL to its original value by popping its contents off the

Program Listing							
7C00		00100		ORG	OP COMPAC 7C00H E DISPLAY	;LOAD COMPAC AT LOCATIO	ON 7000H
						TO BE DISPLAYED	
7CØØ	DS.	00110		PUSH	DE DE	, TO BE DISTERIED	
7CØ1		00110	CKI	PUSH	IY		
	CD3300	00130		CALL		:33H IS ENTRY POINT FOR	
7006		86148		POP	IY	1330 12 ENIKI FOINI FOR	X .
7000		00150		POP	DE		
7009		00160		RET	30		
1009	C9		. VD CCLU		CV 5 D 5 CM D 5	R FRON THE KEYBOARD	
7CØA	DE		KB5CAN	PUSN	CHARACTER DE	FROM THE KEIBOARD	
7CØB		00100	KBSCAN				
			a CN	PUSH	IY	- Obn to mimby bothm bol	n .
7C10	CD2B00	00190 00200	AGN	CALL OR		; 2BH IS ENTRY POINT FOI	
	28FA	90210				; IF NO KEY PRESSED, BON : IF BYTE=BOH, SCAN AGAIN	
	PDE1	00220		JR POP	Z,AGN IY	; IF BITC=BBN, SCAN AGAIN	N
7C15		00220		POP	DE		
7C15		00230		RET	OF	BYTE WILL BE IN A REG	
/ (10	C		- WEE ACE		e x MPCCx	AGE OH SCREEN	
7017	DD7E00		HESAGE	LD LPPAIS	A,(IX)	IGE OR SCREEN	
	FE00	00260	BEBAGE	CP	Ø (AA)	CHECK FOR END OF STRIE	บก
	CA277C	66276		JP	_		
	CD007C	00270		CALL	CRT	DISPLAY BYTE	UKK
	DD23	00290		INC	IX	; INCREMENT POINTER	
	C3177C	00300		JP		GO BACK FOR ANOTHER E	V Tr
7C27		00310	מיזיקים	RET	INDUNGE	100 Bhok Fox Another E.	116
,	C				THE SCREE	and a	
7028	3E1C		CLRCRT	LO	A,1CH	:1CH IS SPECIAL CHARAC	ጥጀን
	CDØØ7C	00330	Chroni	CALL	CRT	iten in process character	IER
	3E1F	00340		LD	A.1FH	:1PH IS SPECIAL CHARAC	ጥድዌ
	CD007C	00350		CALL	CRT	1110 ID DIDCAME CAMENO	IDK
7C32		00360		RET	CIT		
1002	-				A NUMBER	R OF SPACES	
7033	3E20		SPACES	LD		20H IS ASCII CHAR FOR	SPACE
	CD007C	00300		CALL	CRT	B REG CONTAINS # OF S	
	1019	00390		DJHZ	SPACES	, b and comming to. D	PACEO
7C3A		86486		RET	SENCES		
,			POSIT I		S CURSOR		
						POSITION DESIRED	
7C3E	25		POSIT	PUSE	HL	FOSITION DESIRED	
	21003C	00420		LD	HL,3C00F	a	
7C3F		00430		ADD	HL,BC	•	
		22432			,		
						Pro	ogram continues

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ï	MINIMUM ORDER	\$20.00 No.ch	inning charges	or taxes		
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ŀ	PLEASE SEND ME:C		PACKS &	-3 RIBBONS.		
i	WILL USE THESE RIBBON			PRINTER.		//
	\$ENCLO	SED S	END C.O.D.	() :	: (/ /) / .	
ŧ.	Name					
-	Add====					

* TANDY CORP. T.M.

7C40 222840	00440		rD.	(40208),	, SL
7C43 E1	80450		POP	SL	
7C44 C9	88468	•1.18FC 1	RET	Milhoca	OF BLANK TIMES
		BC CONT			OF SLANX LINES DESIRED
7C45 3E13	80478	LINES	LD	A,138	;138 IS ASCII FOR NEWLINE
7C47 CD007C 7C4A 10F8		NXTLIN	CALL	CRT	
7C4C C9	00490 00500		DJHZ RET	NXTLIN	
70.00	00510		*****		
		THE THE	OF CON	PAC ***	
	00530	. T CAD WE			OV 87 78660
7 A 0 0	00570	ILUAD A	ORG	7A00H	RY AT 7A088
7-44					
7A00 41 7A07 00	00500 00590		DEFM DEF9	A ROBO	r'
	00600			_	
7346 3000					LA A FULL BLOCK AT THE CURSOR
7A00 3E8F 7A0A CD007C	98639	DISPLA	LD CALL	A,09FH CRT	; BBPS IS ASCII FOR THE FULL ; SLOCK GRAPHICS CHARACTER
7ABD C9	88648		RET	CNI	TODOCK GRAFFIED CHARACIER
	00650				
7ABE CDBB7A		SODY D	CALL	DNE SODY	SEGMENT
7A11 0601	006 90	JUDI	LD	9,1	
7A13 CD337C	006 90		CALL	SPACES	
7A16 0683 7A18 CD087A	00700	TRUNK	LD CALL	9,3 DISPLA	
7A18 10FB	00720	TUUUY	DJNZ	TRUNK	
7A1D 8681	00730		LD	8,1	
7A1F CD337C	88748		CALL	SPACES	
7A25 C9	00750 00760		CALL RET	DISPLA	
	00770				
7106 004471		:LEGS D			SECHEHT
7A26 CD887A 7A29 8681	88798 88888	LEGS	CALL LD	DISPLA B, 1	
7A28 CD337C	88818		CALL	SPACES	
7A2E CD887A	00828		CALL	DISPLA	
7A31 C9	00830		RET		
	00848 00850	: SEGINN	ING OF M	AIN PROGI	RAM, STARTS AT 70008
7000	00060	,	ORG	7000H	7,000
7000 CD207C 7003 0602		BEGIN	CALL CLI		CLEAR SCREEN
7885 CD457C	00000		LO CALL	B,2 LINES	; SKIP TWO LINES
	00900		CALLE	UINUU	
7000 061C	00910	HSG	LD	9,20	; INSERT 28 SPACES
700A CD337C 700D OD21007	00920 00930		CALL LD		;TO CENTER MESSAGE H;LOAD POINTER
7011 CD177C	00940		CALL		;DISPLAY MESSAGE
7474 433 63	00950				
7814 011F82 7817 CD387C	00960 00970		LD CALL	BC,543 POSIT	POS CURSOR AT 543
701A 0603	00980		LD	9,3	;DISPLAY 3 BLOCKS FOR HEAD
701C CD007A	00990		CALL	DISPLA	
/ WIF 1 WYS	01000 01010		DJHZ	HEAD	
7021 015D02	01020		rD	BC,605	POS CURSOR AT 605
7024 CD3B7C	01030		CALL	POSIT	
7027 0607 7029 CD007A	01040	SHOLDR	LD CALL	B,7 DISPLA	DISPLAY 7 BLOCKS FOR SHOULDERS
702C 10FB	01060	DIJULUR	DJHZ	SHOLDR	
7000 010-00	01070				_1
702E 019D02 7031 CD387C	01000 01090		LO CALL	BC,669 POSIT	; POS CURSOR AT 669
7034 CD0E7A	01100		CALL	BODY	DISPLA ONE BODY SEGMENT
7675 41	01110				
7037 01DD02	01120 01130		LO CALL	BC,733 POSIT	POS CURSOR AT 733
			CALL	BODY	; DISPLA 2ND SODY SEGMENT
703A CD367C 703D CD867A	01140				,
703A CD307C 703D CD0E7A	01150				
703A CD307C 703D CD007A 7040 011F03	01150 01160		LD CALL	8C,799	POS CURSOR AT 799
703A CD307C 703D CD0E7A	01150		LD CALL CALL	SC,799 POSIT LEGS	; POS CURSOR AT 799 ; DISPLA ONE LEGS SEGMENT
703A CD307C 703D CD067A 7040 811F83 7843 CD387C 7046 CD267A	01150 01160 01170 01100 01190		CALL CALL	POSIT LEGS	;DISPLA ONE LEGS SEGMENT
703A CD307C 703D CD0E7A 7040 811F83 7843 CD387C 7046 CD267A 7049 015P03	01150 01160 01170 01100 01190 01200		CALL CALL LD	POSIT LEGS BC, 263	
703A CD307C 703D CD007A 7040 011F83 7043 CD307C 7046 CD267A 7049 015P03 704C CD307C	01158 01160 01170 01100 01198 01200 01210		CALL CALL LD CALL	POSIT LEGS BC, 263 POSIT	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 063
703A CD307C 703D CD007A 7040 011F83 7843 CD397C 7046 CD267A 7049 015P03 704C CD397C 704F CD267A	01158 01160 01170 81108 01198 01200 01210 81220 01230		CALL CALL LD CALL CALL	POSIT LEGS BC,863 POSIT LEGS	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 063 ;DISPLA 2ND LEGS SEGMENT
703A CD307C 703D CD007A 7040 011F83 7043 CD307C 7046 CD267A 7049 015P03 704C CD307C	01158 01160 01170 81100 91198 01200 01210 81220 01230 81240		CALL CALL LD CALL	POSIT LEGS BC, 263 POSIT	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 063 ;DISPLA 2ND LEGS SEGMENT ;PROGRAM STOPS TO ALLOW YOU TO
783A CD367C 783D CD867A 7848 811F83 7843 CD397C 7846 CD267A 7849 815F83 784C CD397C 784F CD267A 7852 CD8A7C	01158 01160 01170 81100 91198 01200 01210 81220 01230 81240 91259		CALL LD CALL CALL CALL CALL	POSIT LEGS BC, 263 POSIT LEGS KSSCAN	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 063 ;DISPLA 2ND LEGS SEGMENT ;PROGRAM STOPS TO ALLOW YOU TO ; SEE PICTURE UNTIL YOU HIT A KEY
703A CD307C 703D CD007A 7040 011F83 7843 CD397C 7046 CD267A 7049 015P03 704C CD397C 704F CD267A	01158 01160 01170 81100 91198 01200 01210 81220 01230 81240	į	CALL CALL LD CALL CALL	POSIT LEGS BC,863 POSIT LEGS	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 063 ;DISPLA 2ND LEGS SEGMENT ;PROGRAM STOPS TO ALLOW YOU TO
783A CD367C 783D CD867A 7848 811F83 7843 CD397C 7846 CD267A 7849 815F83 784C CD397C 784F CD267A 7852 CD8A7C	01158 01160 01170 81108 91198 01210 81220 01230 81240 81250 81278 01278		CALL LD CALL CALL CALL CALL	POSIT LEGS BC, 263 POSIT LEGS KSSCAN	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 063 ;DISPLA 2ND LEGS SEGMENT ;PROGRAM STOPS TO ALLOW YOU TO ; SEE PICTURE UNTIL YOU HIT A KEY
703A CD307C 703D CD007A 7040 011F83 7843 CD397C 7046 CD267A 7049 015P03 784C CD397C 704F CD267A 7052 CD0A7C 7055 CD287C 7050 C3191A	01158 01160 01170 81198 01200 01210 81220 81220 81240 81250 81278 81260 01278 01298	;	CALL LD CALL CALL CALL CALL CALL JP	POSIT LEGS BC, 263 POSIT LEGS K9SCAN CLRCRT 1A19H	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 863 ;DISPLA 2ND LEGS SEGMENT ;PROGRAM STOPS TO ALLOW YOU TO ; SEE PICTURE UNTIL YOU HIT A KEY ;CLEARS SCREEN
703A CD307C 703D CD007A 7040 011F83 7843 CD307C 7046 CD267A 7049 015P03 704C CD307C 704F CD267A 7055 CD287C	01158 01160 01170 81108 91198 01210 81220 01230 81240 81250 81278 01278	;	CALL LD CALL CALL CALL CALL CALL	POSIT LEGS BC, 263 POSIT LEGS K9SCAN CLRCRT	;DISPLA ONE LEGS SEGMENT ;POS CURSOR AT 863 ;DISPLA 2ND LEGS SEGMENT ;PROGRAM STOPS TO ALLOW YOU TO ; SEE PICTURE UNTIL YOU HIT A KEY ;CLEARS SCREEN

The A register is loaded with 13H, the ASCII code for a new line, and the CRT subroutine is catted. This causes the cursor to be positioned at the beginning of the next line. The next instruction, DJNZ NXTLIN, decreases the B register and repeets the instruction until the register is zero.

Robots

To illustrate the subroutines, write a simple program (see List-Inc).

Now we come to the robots:

- Skip two lines.
- Print the title, "A ROBOT".
- Print a picture of a robot using the TRS-80 graphics.

The first thing we do is load the message into memory. ORG 7A00H defines the place in memory and DEFM defines the characters we want. DEF 0 places a 0 in the next location. DISPLA is the first routine used to display one block. 191 is the value of its ASCII code.

The next two routines, BODY and LEGS, display one body and one leg segment. A body segment consists of a block, a space, three blocks, a space and another block. The leg is made of a block, a space and another block.

The first statement of the main program, ORG 7000H, sets the place in memory where the program will reside. Clear the screen. Skip two lines by loading the B register with 2 end calling the LINES subroutine. To displey the title, displey 28 spaces in order to center the measage. Load the IX register with the starting address of the message and call the MESAGE aubroutine to display A ROBOT. The next part is the actual display of the robot's image! These statements position the cursor and display the appropriate parts of the robot.

Then we call KBSCAN to stop execution, and admira the picture we just displayed.

The robot will stay until we hit a key. After this we clear the screen again.

The last statement, JP 1A19H, returns us to BASIC.■

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when PMC-80 was first introduced to the United States, the response was overwhelming! The Computer World was ASTONISHED at the QUALITY, as well as the PRICE. In fact, the PMC-80 has almost all the features of America's best selling computer, the TRS-80, but with a price tag of \$200.00 less! (SIMUTEK'S price is \$275.00 less!)

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expansion interface Expandable to 4 floppy disk drives (over 100,000 characters of	Yes	Yes
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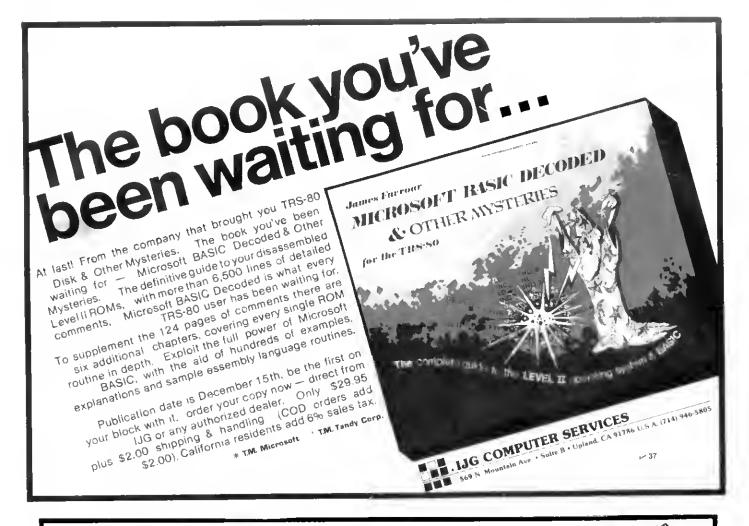
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replace cover DONE!

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Wow! Automatic activation for the Shack's line printer, with software control, no less.

Turn-On

Dr. J. H. Nestor 39114 Rt. 303 Grafton, OH 44044

After using the Redlo Shack Tractor Feed Line Printer with my TRS-80 for about two months, I ceme to two conclusions: It is a reasonable machine for personal and small business use; but something had to be done about that damned on/off switch!

Centronics, who manutactures the printer as their model 779, saw fit, for some perverted reeson, to employ both a power switch and a print switch. The print switch controls the printer electronics, and is conveniently located on the front panel with an LED indicator.

Supposedly, this switch is turned on only when ectually printing. However, since there is little current drewn, most users feave this switch in the on position ell the time.

The power switch, which controls the motors, cooling fan, and AC to the printer, is located on the back panel, where it is difticult to reach.

No Noisier than Most

So, why not just turn on the printer when you bring up the computer? Those who would eak this type of question have never heard this printer in operation. Actually, it is no noisier than most while it's printing.

But try to concentrate on your programming with the machine idling. The constant whirring,

buzzing, growling and slapping of drive belts is guaranteed to drive you to distraction in minutes.

Now you quip, "Big Deal! Just reach over and turn it off!"

Dear friend, unless your arms are seven feet long, you can't reach that switch. Even if the printer is sitting on the same teble with the TRS-80 you still can't reach the switch without getting out of the cheir end leening over the beck. Too much like work!

Let me digress for a moment to touch on my philosophy of microcomputing. For years, I have watched with fascination as TV

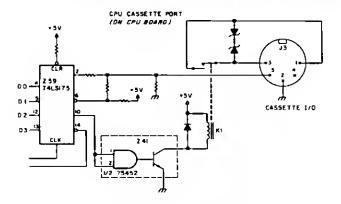
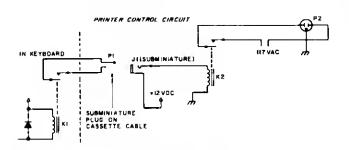


Fig. 1. Cassette Port on CPU Board



Flg. 2, Printer Control Circuit

```
CLS: PRINT
28 PRINT"DEMONSTRATION OF PRINTER CONTROL"
30 PRINT
   INPUT"WHICH CASSETTE PORT ARE YOU USING (I OR 2)"; A
58 IF A=2 THEN POKE 14388,1
68 PRINT:PRINT"THE PRINTER WILL START.....NOW"
78 OUT 255,4:FOR X=I TO 288:NEXT
   LPRINT"THIS IS A CEMONSTRATION OF TRS-00 SOFTWARE FO
   LPRINT"ON/OFF CONTROL OF THE LINE PRINTER."
188 LPRINT"THE PRINTER NILL STOP & THERE WILL BE A DELA
    LPRINT"STARTING.....NOW"
128 OUT 255,8
194 PRINT THERE WILL BE A DELAY...PLEASE NAIT
    FOR X=1 TO 5888
158 NEXT X
160 PRINT: PRINT NOW RESUME PRINTING......
178 OUT 255,4:FOR X=1 TO 288:NEXT
188 LPRINT THE PRINTER IS ON ONCE AGAIN, THIS CONCLUDES
198 LPRINT"THE DEMONSTRATION, YOU SHOULD BE ABLE TO SEE
      HOW"
    LPRINT THE COMMANDS CAN BE INCLUDED IN ANY BASIC PR
     OGRAN.
218 OUT 255.8
    PRINT: PRINT" END OF PRINTER ON/OFF CONTROL DEMONSTRA
238 END
DONE
         Program Listing 1. Demonstration Program
```

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facility by your BASIC program. Set the number of nulls to carrier is lost, turn MOST on and off, switch to channel A or B terminal to "BREAK" BASIC, identify whether a character came from the HOST'S keyboard or from the REMOTE'S and more. No knowledge of assembler needed. All options may be accessed from BASIC or ASSEMBLER. Complete with detailed documentation. Don't isolate your Model II, Let

as desired, enable and disable the ability for the remote

From the original author of the TRS-80 HOST and TERM systems in the RADIO SHACK "COMMUNICATIONS Systems in the RADIO SHACK "COMMUNICATIONS PACKAGE". This system allows the full control of the HOSI be sent after a C/R, set a command line to be executed if

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Parts List

and movies have shown how computers are used in their world. "Turn on the vectored whatsits." "Zoom in on that monster." "Disarm those missiles." "Blast 'em!"

Amazing! Those guys are controlling motors, reading meters, and launching missiles from that terminal. They don't have to get up and turn on any printers, so, why should !?

To achieve my goal of complete keyboard control, I have spent countless hours soldering, drilling and stringing wires so that, now, I don't have to leave the keyboard for anything but a beer (and I'm working on that).

My TRS-80 dials the phone, turns on the lights and sends Morse code on my amateur radio rig—all without any extra switches. Now, I can even control my printer, and I've decided to share the secret with you.

Raiay Control

My approach is simple. Heave the power and print switches on and control the AC to the printer with a reley. The TRS-80 controls the relay via softwere commands.

The first secret lies In the use of the cassette relay as a control. The cassette motor is controlled by a small relay which is driven by a latched output port in the CPU keyboard unit (Fig. 1).

The relay is small, so don't get any Ideas about switching heavy loads with it. But, you can use it to control another heavier load relay. That is how my system works.

Fig. 2 is a schematic of my circuit, using a Radio Sheck relay #275-206. It is rated to switch three amps at 120 volts AC; the coll is 12 volts DC at 50 milliamps. This load is well within the limits of the relay in the TRS-80.

This isn't a construction article, as such, so I'll leave the details to you. Wiring Is strictly non-critical. I stole 12 volts of DC from another source, but you could add a small DC supply for the relay. A different relay can, of course, be substituted so long as it will handle about two and a helf amps, and the coil doesn't draw more than one-half amp. Of course, the less current through the CPU relay the better. My relay is housed in a cabinet but this, too, is non-critical.

If you have an expansion interface, there is another relay in that unit. It is a 4POT switch used to select either of two cassette mechines. The CPU relay turns on the cassette motor, while the interface relay decides which cessette port will be ac-

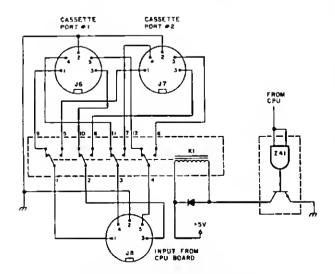


Fig. 3. Expansion Interface Cassette Ports

```
10 CLS
20 PRINT
   PRINT PRINTER STATUS CHECK
30
   B=PEEK(14312)
50 PRINT
   PRINT THE VALUE AT ADDRESS 14312 IS ";B IF B<>127 THEN 128
   PRINT
   PRINT"THE PRINTER IS OUT OF PAPER"
PRINT"INSERT SOME MORE PAPER, THEN PRESS ENTER";
100 INPUT AS
128 PRINT PRINT THERE IS PAPER IN THE PRINTER ...
138 IF B>127 THEN PRINT BUT THERE IS STILL SOMETHING WR
                      PRINT "SRUT DOWN THE SYSTEM AND CHECK
THINGS OUT"; END
140 IF BC127 THEN PRINT"AND ALL SYSTEMS ARE READY TO PR
150 END
DONE
```

Program Listing 2. Printer Status Check

tivated. Fig. 3 shows how this system operates.

If you are not using a cassette recorder with your TRS-80, you can connect your relay to cassette port 1.

If you still use a cassette machine occasionally, you can connect the cassette to port 1 and the printer relay to port 2.

Software Commands

I hate to disappoint some of you, but the software is also simple. The commends OUT 255,4 turn on the printer and OUT 255,0 turn it off.

These commands can be included as part of a BASIC program. OUT 255,4 is issued just before the first LPRINT statement, and OUT 255,0 is used after the last LPRINT operation.

The OUT 255,4 statement latches the relay on until the program ends and READY appears, or until an OUT 255,0 is executed.

If you wish to control the printer from cassette port 2, an additional bit of software is needed. Memory location 14308 decimal contains the cassette port selection code. On power-up this value is set to 0. This activates cassette port 1. A POKE 14308,1 command tranfers control to port 2.

You can perform this step at the beginning of a program or eny time before the first LPRINT statement. It is only needed once in the program. However, if the program uses the cassette system for any other purpose, a POKE 14308,0 must be used to restore normal cassette operation. This includes CSAVE, CLOAO, PRINT #, and INPUT # statements.

Both the POKE 14308,(1 or 0) and the OUT 255,(4 or 0) can also be issued in the command mode. For example, if you want to LLIST a program, typing POKE 14308,1:OUT 255,4 and pressing the ENTER key will turn on the printer and print the program listing. OUT 255,0 is not needed, since the system returns to READY after the list is printed. Of course, if your relay is connected to cassette port 1, the POKE 14308,1 is not required.

If you want to get fancy, some additional softwere features are eveilable to you. When the printer electronics are turned on a status signal is sent to the printer port in the expansion interface. It indicates whether or not the printer is turned on, and if it is out of paper. This printer status value is found in memory location 14312 decimal.

By PEEKing into that address, we can determine if the printer is ready to run. A value of 127 indicates that the printer is out of paper. If this is the case, a message can be printed on the screen, and the program interrupted.

A value of <127 signals that the printer is ready to run. You may want to play around with different uses for this printer status information. I'll leave it up to you.

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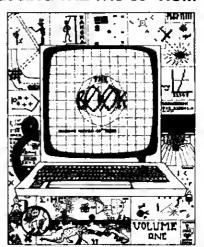
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Using EDTASM to enhance itself.

Assemble It Yourself

Richard Koch 2740 Washington St. Eugene, OR 97405

Padio Shack sells an excellent editor/assembler for the TRS-80. Unfortunately, this assembler makes extensive use of the cassette recorder.

A typical assembly programming session goes something tike this:

Load the EDTASM tape. Write a program. Record the program on a second cassette tape. Record the corresponding machine language code on a third tape. Return to BASIC and run this system tape.

It doesn't work?

Reload the EDTASM tepe. Reload the tape containing the program. Continue.

If you're like me, you couldn't weit to get hold of a disk system and throw the cassette recorder away. But without modification the assembler will not work with a disk. In fact, it can't even be loaded on a disk because it resides in the same area of memory used by DOS.

I am going to describe e new version of the editor/assembler. The original assembler can be used in bootstrap fashion to create this new version. Programs written on the modified assembler can be run without using the cassette or disk at ell. Once written, programs can be saved on disk.

Additional commands convert the editor into a word processing system. This new editor/essembler requires at least 32K of memory.

Modifying EDTASM

Assume for a moment that the modification has been made. Enter the new assembler from the disk by typing EDTASM (ENTER). After a short pause, the words "TRS-80 EDITOR-AS-SEMBLER 2.1" (or 2.2) will be printed on the screen. This new version has all the original commands. Refer to the instruction book for an explanation of them.

Several small modifications have been made. First of all, the command B returns control to DOS instead of BASIC. A keyboard debounce routine has been added. The text buffer Is restricted to memory slots 5CF9-7FFF (or 5CF0-7FFF tor version 1.2), which is the standard buffer for mechines with 16K.

The function of the up arrow has been changed to display the previous page of text. The down arrow now prints the next line of text without an intervening star and makes it possible to go through the text line by line. The CLEAR key works.

A lowercase driver is avail-

able for readers who have added lowercase hardware. The printer routine hes the ability to pause after each page. The BREAK key now works during printing. An optional serial printer driver is included.

There are also additional commands which will be convenient to discuss in groups.

Easier AL Programming

The assembler has two new commands designed to make assembly lenguage programming easier:

M0 Method Zero. M1 Method One.

The command M1 changes the method of text entry. Suppose we wish to enter the following:

LINE LD A,6 ;COMMENT HERE

To do so, type LINE and presa the space bar. The computer will tab to the next position. Type LD and presa the space bar. Again the computer will tab to the following position. Type A,B and press spacebar. This time the computer will tab to the comment column end enter the semicolon comment prompt.

Now type the comment as usual. The space bar will no longer tab; instead it will resume its usual function. If en entire line is to be a comment, type ";" and the space bar will never act as a tab.

In this keyboard mode, backspacing pest a tab can lead to unpredictable results. If a mistake in an earlier column is to be corrected, erase the entire line and start over or use EDIT.

The command M0 returns the editor to the original keyboard entry mode. When the system powers up, it will be in entry mode one.

No Tapes, No Disks

The assembler has four new commands which allow immediate execution of essembly language programs without using the cassette or the disk:

AM Assemble into Memory.
PEEK Examine Memory.
POKE Modify Memory.
Jump.

Suppose the text buffer contains an assembly language program. The command AM works, essentially, like the usual AS-SEMBLE. The computer prints an essembled version of the program on the screen and then types MOVE CODE? When the space ber is pressed, the machine language program will be entered into the computer instead of being loaded on tape.

This program must occupy memory in the renge A000-BFFF hex. Otherwise the computer will print MEMORY TOO LOW or MEMORY TOO HIGH and return to the assembler prompt. (Reeders with 48K may change this renge to A000-FFF.)

The J command is used to

transfer control to a machine language program created by AM. Thus, J A98C causes the computer to jump to location A98C (hex) and begin execution at that position. This command requires that the eddress be given in hex. The hex number should be four digits long and should not be followed by H. Thus, J 3C45, J BC11, and J 3542 are all correct es written.

A program that is to be executed by J should end with the instruction RET. This will return the essembler prompt * when the program is finished; the text buffer will remain intact.

The editor/assembler maintains a stack which can be used by the machine language program. Of course, if the machine program initializes enother stack, the command RET will not return control to the assembler. In that case the program should end with the command JP 8F01H to return control to the editor/assembler. Initializing the stack is among the first things it does.

Programs executed with J may use BASIC ROM routines. A few users will want to use EDTASM routines instead. They should use JU (thus JU A2AD) instead of J and end programs which modify the stack pointer with JP 46DAH.

If it is necessery to exemine and modify memory, PEEK and POKE are used. Both of these commands are written for hex numbers. Thus PEEK 4D23 will cause the computer to print the contents of 4D23, and these contents will be printed in hex. Similarly, POKE 4D23,3E will enter the hex number 3E in memory location 4D23.

Disk Data Storage

The assembler has three commands designed to allow storage of data on the disk:

X Move Text to High Memory.
Y Move Text from High Memory.
AM+&&& Assemble into Memory Plus &&&&.

X moves the text buffer into memory locations 9CF0-BFFF. It also prints a message of the form (START = X'9CF0',END = X'A9CE') on the screen. Using this command, it is possible to load the text buffer anto disk as follows:

Enter X. Copy the displayed information about START and END on a piece of paper because the next step clears the screen. Enter B. You will find yourself in DOS mode. Enter:

DUMP FILENAME/CIM (START = X'9CF0', END = X'A9CE')

Naturally, the end statement varies from text to text.

At this point, you can return to the assembler with the text buffer intact. To do so, type ED-TASM (ENTER) Y (ENTER).

Y moves the text buffer from locations 9CF0-BFFF down into the assembler. It is used to load

text files from the disk into the essembler. To load such a file, return to DOS mode and enter LOAD FILENAME, EDTASM and Y.

Machine language programs are prepared for entry to the disk using the command AM. Suppose the text buffer contains an assembly language program which will be located somewhere between A000 and BFFF. Enter the corresponding machine code into the computer using AM. Return to DOS via the B command. Load the machine code onto the disk using a command similar to:

DUMP FILE/CMD (START = X'A02E',END = X'A02E',END = X'613C',TRA = X'A111')

Occasionally you will want to write code which will not occupy memory. In the interval A000-BFFF. The command AM+ is used for this purpose. AM+ 3C11, for instance, works just like AM except that the hex number 3C11 is added to each memory address before it is entered into the computer.

Suppose you want to write mechine code starting at 7500. (All addresses here are in hex form.) This address is safely above the DOS addresses, but it is within the EDTASM area. Write the essembly code as ueual. Enter the comand AM+2B10. (Notice that 2B10 is A010 minus 7500.) Write the following program and assemble it into memory:

LD HL0A010H
LD DE,7500H
LD BC.Number of Sytes in Program

ORG 0A000H

LD DE,7500H
LD BC,Number of Bytes In Progren
LDIR
JP 0

Finally, enter the command J A000. The disk will turn on for a moment end you will find yourselt in DOS mode with the machine language program in its intended position. Save it on disk as usual.

Word Processing

Finally, the assembler has two commands designed to convert the editor into a primitive word processing system. The word processing commands are:

M2 Method Two.
TYPE Print Text.

The command M2 provides yet another method of entering text into the computer. With this method text can be entered continuously without the ENTER key. The computer will eutomatically issue line feeds at appropriate spots. Line feeds will occur between words when possible, but occasionally the computer will break a word in the middle.

M2 makes one other change. Shifted letters are not accepted under keyboard entry methods zero and one unless you add the lowercase modification. But shifted letters are accepted under method two. Such letters

Program Listing 1. EDTASM 1

```
00100 ;
                                                   Turn on DEBUG and use the M-command to
                      INSTRUCTIONS:
                                      Enter DOS.
                                               Return to DOS, turn off DEBUG, and issue the
              00110
                       enter the code below.
              00120
                       command BASIC2.
                                        Answer MEMORY SIZE with RETURN.
                                                                           Issue the SYSTEM
                       command. Respond to the prompt with EDTASM and load the EDTASM
              00130
                             Respond to the second prompt with /40960. You will
              00140
                       tape.
              00150
                       automatically return to DOS.
                                                      Enter
              00160
                       DUMP EDTASM1/CIM (START=X'7000', END=X'8A00').
              00170
              00180
                       TEMPORARY CODE TO PUT EDTASM ON DISK
              00190
              00200 ;
              00210 ;
A000
                             ORG
                                      0A000H
              00220
A000 P3
              00230
                             DΙ
A001 210043
              00240
                             LD
                                      HL,4300H
              00250
                                      DE,7000H
A004 110070
                             LD
                                      BC, 1A00H
A007 01001A
              00260
                             ĽD
AOOA EDBO
               00270
                             LDIR
A00C C30000
              00280
                             JΡ
                                      0000
                             END
0000
               00290
00000 TOTAL ERRORS
```

will be displayed on the screen es ordinery capital letters, of course. We will see their significance shortly.

M2 affects all entry from the keyboard, including responses to the assembler prompt. This will make no difference unless you are in the habit of shifting tetters at rendom. A shifted tetter looks the same on the screen, but means something different to the computer. Convert back to the original keyboard entry method with M0 if you run into trouble.

The TYPE command works essentially like the editor/as-

sembler command T; it outputs the text buffer to the printer.

The text in the buffer can be created by eny of the keyboard entry methods, but from now on I will essume that text is entered with M2.

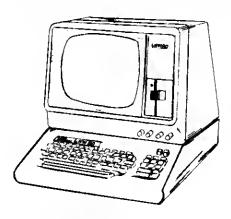
Text that will be printed first enters an internal buffer. When

this buffer has enough text to fill a line, the computer searches beckward from the end until it comes to a space. All characters before the space are printed and the remaining characters are placed at the beginning of the buffer for the next line.

continues to page 238

```
Program Listing 2. EDTASM 2
                                                     Load EDTASM1. Turn on DEBUG and enter
               00100 ; INSTRUCTIONS:
                                         Enter DOS.
               00110 ; the code below using the M-command. Return to DOS, turn off DEBUG, 00120 ; and enter DUMP EDTASM2/CMD (START=X'7000',END=X'8B30',TRA=X'8A00').
                                                                 Return to DOS, turn off DEBUG,
               00130
                              There is an alternate way to do this.
                                                                         Using the unmodified
                     •
                        EDTASM, assemble the code below and output it to cassette tape.
               00140 ;
                                                        Enter BASIC and load the system tape
               00150
                        Enter DOS and load EDTASM1.
                                        Return to DOS and dump EDTASM2 as before.
               00160 ; just created.
               00170 ;
                                                                                It has a smaller
                              You may test the result by running EDTASM2.
               00180 ; than normal edit buffer and its cassette operations have been
                        temporarily disabled, but it will assemble code directly into
               00190
                        memory when you hit ENTER after the prompt READY CASSETTE.
               00200
               00210
               00220 ;
                        CODE TO RELOCATE EDTASM IN CORRECT POSITION
               00230 ;
               00240
               00250 ;
                               ORG
                                        8A00H
8A00
               00260
                                                          ;Relocate EDTASM and run
8A00 F3
               00270
                               DΙ
8A01 210070
               00280
                               LD
                                        HL,7000H
                                        DE,4300R
8A04 110043
               00290
                               LD
                                        BC, 1A00H
                               LD
8A07 01001A
               00300
8A0A EDBO
               00310
                               LDIR
8A0C C38A46
               00320
                               JP
                                        468AR
               00330 ;
               00340
               00350 , CODE TO INTERCEPT TAPE OUTPUT AND ASSEMBLE DIRECTLY INTO MEMORY
               00360
               00370
8AOF E5
               00380 ASSEM
                               PUSB
                                        HL
                                                          ;Begin assembling code into memory
8A10 D5
               00390
                               PUSH
                                        DE
8A11 C5
               00400
                               PUSB
                                        BC
8A12 F5
               00410
                               PUSH
                                        AF
                                        B, A
8Al3 47
               00420
                               LD
                                                          ;Current output byte
                                        A, (ADD+2)
                                                          ;Determine position in assembly cycle
8A14 3A1B8B
               00430
                               LD
8A17 FE00
               00440
                               CP
8A19 2838
               00450
                                        Z, ZERO
                               JR
SAIB PEO1
               00460
                               ÇР
                               JR
                                        Z.ONE
8AlD 283F
               00470
BALF PE02
               00480
                               CP
                00490
                               JR
8A21 2840
                                        Z, TWO
8A23 FE03
               00500
                               СP
                               JR
                                        Z. TWO
8A25 283C
                00510
8A27 FE04
               00520
                               CP
8A29 2838
                00530
                               JR
                                        Z, TWD
8A2B FE05
                00540
                               CP
                                        Z, TWD
8A2D 2834
                00550
                               JR
                               CP
8A2F FE06
                00560
8A31 2830
               00570
                               JR
                                        Z, TWO
                00580
                               CP
8A33 FE07
                00590
                               JR
                                        Z, TWO
8A35 282C
                00600
                               CP
8A37 FE08
                                        Z, EIGHT
8A39 2831
                00610
                               JR
8A3B FE09
                00620
                               CP
8A3D 2848
                00630
                               JR
                                        Z, NINE
                00640
                               CP
                                        10
BA3F FEOA
                                        Z, TEN
8A41 284A
                00650
                               JR
8A43 FEOB
                00660
                               ÇР
                                        11
8A45 2850
                00670
                               JR
                                        Z, ELE
8A47 FEOC
                               CP
                00680
                                        12
8A49 CAEE8A
                00690
                               JP
                                        Z TWE
8A4C FEOD
                00700
                                CP
                                        13
8A4E CA098B
                00710
                                JР
                                        Z, THI
                00720
                                JR
                                        END
8A51 1814
8A53 78
                                                          ;Leader and sync byte
                00730 ZERO
                               LD
                                        А,В
8A54 FE00
                00740
                                CP
                                        n
                                         Z, END
8A56 280F
                00750
                                JR
```

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```
0A5B
                                CP
8A58 FEA5
                00760
8A5A 2019
                00770
                                JR
                                         NZ, ERR
8A5C 1805
                                         TWO
                00780
                                JR
BA5E 78
8A5F FE55
                00790 ONE
                                LD
                                         A,B
                                                            ;Start byte
                                CP
                                         55B
                00800
8A61 2012
                00810
                                JR
                                         NZ, ERR
                                LD
                                         HL, ADD+2
                                                            ; Name of tape
8A63 211BBB
                00820 TWO
                00B30
                                INC
                                         (HL)
8A66 34
                                                            ;Return to assembly routine
8A67 F1
                00840 END
                                POF
                                         AF
                00850
                                POP
                                         BC
8A68 C1
8A69 D1
                00860
                                POP
                                         DE
                                         BL
                00870
                                POP
8A6A E1
8A6B C9
                00880
                                RET
                                                            ;Beginning of code
8A6C 78
                00890 EIGHT
                                LD
                                         A,B
8A6D FE3C
                00900
                                CP
                                          3CH
                00910
                                          z, TWO
8A6F 2BF2
                                JR
                                                            ; or end of tape
8A71 FE78
                00920
                                CP
                                          78B
8A73 280B
                00930
                                 JR
                                          Z.DONE
8A75 217B8A
                00940 ERR
                                LD
                                          HL, ERRO
                                                            ;Print error message and end
8A78 C32B47
                00950
                                          472BB
                                JP
                00960 ERRO
                                EQU
8A7B
                                          ie'
8A7B 45
                00970
                                DEFB
8A7C 52
                00980
                                DEFB
                                          'R'
8A7D 52
                00990
                                          1 R1
                                DEFB
                                          10
8A7E 4F
                01000
                                DEFR
8A7F D2
                01010
                                DEFB
                                          OD2H
8A80 211BBB
                01020 DONE
                                 LD
                                          HL, ADD+2
                                                            ; Ignore remaining output
                                 LD
                                          (BL),14
                01030
8A83 360E
8A85 18E0
                01040
                                 JR
                                          END
8A87 211FBB
                01050 NINE
                                LD
                                          HL, ADD+6
                                                            ; Number of code bytes to follow
8A8A 70
                01060
                                LD
                                          (HL),B
                01070
                                          TWO
8A8B 18D6
                                 ĴR
                                                            ;Low byte of code address
8A8D 211C8B
                01080 TEN
                                 LD
                                          HL, ADD+3
                01090
                                 LD
8A90 78
8A91 77
                01100
                                 LD
                                          (HL),A
                                 INC
                                          HL
8A92 23
                01110
8A93
      23
                01120
                                 TNC
                                          HL
                                          (HL),A
8A94 77
                 01130
                                 LD
8A95 18CC
                 01140
                                 JR
                                          TWO
                                          BL, ADD+4
                                                             ;High byte of code address
                                 LD
8A97 211D8B
                01150 ELE
8A9A 70
                 01160
                                 LD
                                          (HL),B
8A9B 23
                 01170
                                 INC
                                          HL
                                          A, (HL)
8A9C
     7 E
                01180
                                 LD
8A9D 80
                 01190
                                 ADD
                                          A,B
      77
                 01200
                                 LD
                                          (BL),A
8A9E
      21198B
                01210
                                 LD
                                          BL, ADD
8A9F
                                 LD
                                          E, (HL)
8AA2 5E
                 01220
8AA3
      23
                 01230
                                 INC
                                          HL
8AA4 56
                 01240
                                 LD
                                          D, (HL)
8AA5 3A1D8B
                 01250
                                 LD
                                          A, (ADD+4)
                                 LD
8AA8 67
                 01260
                                          H,A
                                          A, (ADD+3)
                                 LD.
8AA9 3AlC8B
                 01270
8AAC
      6 F
                 01280
                                 LD
                                          BL, DE
BAAD 19
                 01290
                                 ADD
                                          (ADD+3),HL
8AAE 221C8B
                 01300
                                 LD
                                                             ; Temporarily allow assembly anywhere
8ABl
      18B0
                 01310
                                 JR
                                          TWO
                 01320
                                          A,H
8AB3 7C
                                 LD
                                 CP
                                          0 A 0 H
8AB4 FEA0
                 01330
8AB6
      380 D
                01340
                                 JR
                                          C, ERR2
8AB8 FEBF
                 01350
                                 CP
                                          OBFH
8ABA
      38A7
                 01360
                                 JR
                                          C. TWO
8ABC 200D
                                          NZ, ERR3
                01370
                                 JR
8ABE 7D
                 01380
                                 LD
8ABF FE80
                01390
                                 CP
                                          80H
8AC1 3008
                01400
                                 JR
                                          NC, ERR3
                01410 OK1
8AC3 189E
                                 JR
                                          TWO
                                          HL, ERRO2
8AC5 21D18A
                01420 ERR2
                                 LD
8ACB C32B47
                 01430
                                 JP
                                          472BH
                 01440 ERR3
8ACB 21DF8A
                                 LD
                                          HL, ERRO3
8ACE C32B47
                 01450
                                 JP
                                          472BB
                01460 ERRO2
RADI
                                 EOU
8AD1 4D
                 01470
                                 DEFB
                                          'M'
                                          * E 1
8AD2 45
                 01480
                                 DEFB
                                          'M'
8AD3 4D
                 01490
                                 DEFB
                                          101
8AD4
      4F
                01500
                                 DEFB
8AD5
      52
                 01510
                                 DEFE
                                          'R'
                                          'Y'
8AD6
      59
                 01520
                                 DEFB
                01530
8AD7
      20
                                 DEFB
                                          * T '
8AD8 54
                 01540
                                 DEFB
                                          101
8AD9
      4 F
                 01550
                                 DEFB
                                          '0'
      4 F
                 01560
                                 DEFB
8ADA
8ADB 20
                 01570
                                 DEFB
8ADC 4C
                 01580
                                 DEFB
                                          'L'
                                                                                                Program continues
```

Reader Service—see page 274

OOBFE-ZYB/II

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```
01590
                                         '0'
8ADD 4F
                               DEFB
8ADE D7
                01600
                               DEFB
                                        OD7H
8ADF
                01610 ERRO3
                               EQU
8ADF
     4D
                                         'M'
                01620
                               DEFB
                                         'E'
8AE0 45
                01630
                               DEFB
                                         'M'
8AE1 4D
                01640
                               DEFB
8AE2
     4 F
                01650
                                         '0'
                               DEFB
8AE3
     52
                01660
                               DEFB
                                         181
                                         ' Y 1
8AE4 59
                01670
                               DEFB
8AE5
     20
                01680
                               DEFB
8AE6
                01690
                                         T
                               DEFB
8AE7
     4F
                01700
                                         '01
                               DEFB
                                         101
BAES 4F
                01710
                               DEFB
8AE9 20
                01720
                               DEFB
                                         'R'
8AEA 48
                01730
                               DEFB
               01740
                                         'I'
8AEB 49
                               DEFB
                                         ' G '
8AEC 47
                01750
                               DEFB
SAED CS
                01760
                               DEFB
                                        0C8H
8AEE 78
                01770 TWE
                               LD
                                                          ;Actual code
                                        A,B
                                        HL, (ADD+3)
8AEF 2A1C8B
                017B0
                               LD
8AF2 77
                01790
                               LD
                                        (HL),A
8AF3 23
                01800
                               INC
                                         BL
8AF4 221C8B
                01810
                                         (ADD+3),HL
                               LD
8AF7 211E8B
                                        HL, ADD+5
                01820
                               LD
8AFA 46
                01830
                               LD
                                        B, (BL)
BAFB 80
                01840
                               ADD
                                        A,B
BAFC 77
                01850
                               LD
                                         (HL),A
8APD 23
                01860
                               INC
                                        HL
8AFE
     7 E
                01870
                               LD
                                        A, (BL)
8AFF 3D
                01880
                               DEC
                01890
                                        Z,TWO
8B00 CA638A
                               JP
8B03 321F8B
                01900
                               LD
                                         (ADD+6),A
8B06 C3678A
                01910
                               JF
                                        END
8B09 78
                01920 THI
                               LD
                                                          ;Check sum
                                         A,B
8B0A 211E8B
                01930
                               LD
                                        HL, ADD+5
8BOD BE
                01940
                               CP
                                         (HL)
8B0E C2758A
                01950
                                JF
                                        NZ, ERR
8B11 3E08
                01960
                               LD
                                        A,8
8B13 321B8B
               01970
                                         (ADD+2),A
                               LD
8B16 C3678A
                01980
                               JP
                                        END
                01990 ADD
8B19
                               EQU
                                        $
8B19 00
                02000
                                        ٥
                               DEFB
                                                          ;Low byte of addition to memory
881A 00
                02010
                               DEFB
                                        0
                                                          ; Righ byte of addition to memory
8B1B 00
                02020
                                                          :Position in assembly cycle
                               DEFB
                                        Q
881C 00
                02030
                                        ٥
                               DEFB
                                                          ;Low byte of current memory
8BlD 00
                02040
                               DEF8
                                        0
                                                          ; Bigh byte of current memory
8B1E 00
                02050
                               DEFB
                                        0
                                                          Check sum
8B1F 00
                02060
                               DEFB
                                        0
                                                          ; Number of bytes
               02070 CONT
8B20
                               EQU
                                        S
               02080 ;
                02090
               02100 ; CODE TO SET TOP OF EDIT BUFFER
               02110 ;
               02120
7395
               02130
                               ORG
                                        7395H
7395 21FF6F
7398 221341
                                        BL,6PPFB
               02140
                               LD
                                                          ;Temporary value; eventually 7FFFH
               02150
                               LD
                                         (4113H),HL
739B C3A246
                02160
                               JF
                                        46A2H
                02170
               02180
                        TEMPORARY CODE SENDING CASSETTE OUTPUT TO ABOVE ASSENBLY ROUTINE
                02190
                02200
                02210 ;
703D
                               ORG
                                        703DH
               02220
703D C9
               02230
                               DEFB
                                        0C9H
7089
                02240
                               ORG
                                        7089H
7089 C30F8A
                02250
                               JP
                                        ASSEM
                02260
                02270
                02280
                        TEMPORARY CODE INITIALIZING ASSEMBLER
                02290
                02300
73DA
                02310
                               ORG
                                        73DAH
                                                          ;Start of cleanup before EDTASN prompt
                                        CONT
73DA C3208B
                02320
                               JP
8B20
               02330
                               ORG
                                        CONT
                               LD
8B20 31FE42
                                        SP,42FEH
                                                          ;Command replaced by JP
               02340
8B23 211B8B
                02350
                               LD
                                        HL, ADD+2
                                                          :Assembler cycle position
8B26 3600
                02360
                               LD
                                        (HL),0
8B28 C3DD46
                02370
                               JP
                                        46DDH
               02380
                02390
0000
                02400
                               END
00000 TOTAL ERRORS
```

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```
Program Listing 3. EDTASM 3
               00100 ; INSTRUCTIONS:
                                       Run EDTASM2.
                                                       Enter the text below and assemble it.
               00110 ;
                       Answer the prompt READY CASSETTE with ENTER; the revisions will
               00120
                     : be entered directly into the computer.
                                                                   The new code affects the
                       running version of EDTASM adversely, so immediately
               00130
               00140
                       return to DDE via the 8 command and enter
               00150
                       DUMP EDTASM3/CHD (START=X'7000', END=X'8C5E', TRA=X'8A00').
                             You may test the new version of EDTASM. The cassette
               00160 ;
                                                    From now on, you must use the command
               00170
                       operations are reenabled.
               00180
                       AM to assemble directly into memory.
               00190
               00200
                       CODE INITIALIZING ASSEMBLER SEFORE EDTASM PROMPT
               00210
               00220
               00230
               00240 ;
                       Owners of Varsion 1.2 should change ASSEM1 to 51E7H.
51E3
               00250 ASSEM1
                              EQU
                                       51E3H
               00260 CONT
                              EQU
                                       8B20H
8820
                              EQU
8B19
               00270 ADD
                                       8B19R
                                       8A0FH
8AOF
               00280 ASSEM
                              EOU
8B20
               00290
                              ORG
                                       CONT
                                                         ;Start of cleanup before prompt
                                       SP,42FER
                                                         ;Command replaced by JP
8820 31FE42
               00300
                              LD
                              LD
                                       RL, ADD
                                                         ; Initialize assembler
8B23 21198B
               00310
                                       (RL),0
8B26 3600
               00320
                              LD
8B28 23
               00330
                              INC
                                       HL
                                       (RL),0
8B29 3600
               00340
                              LD
8B2B 23
                              INC
               00350
                                       RL
8B2C 3600
                                       (HL),0
               00360
                              LD
8B2E 213D43
               00370
                              LD
                                       HL,433DB
                                                         ;Enable cassette operations
8831 36E5
               00380
                              LD
                                       (HL),0E5H
                                       HL,4389H
8833 218943
               00390
                              LD
8B36 36E5
               00400
                              LD
                                       (HL),0E5H
8B38 23
               00410
                               INC
                                       HL
8B39 36C5
               00420
                                       (HL),0C5H
                              LD
               00430
8B39 23
                              INC
                                       HL
893C 36D5
               00440
                              LD
                                       (HL),0D5H
8B3E AF
               00450
                              XOR
                                                         ; Method zero for EDTASM
883F 32458B
                                       (TYPE),A
               00460
                              LD
                               JP
8B42 C3DD46
               00470
                                       46 DDH
8B45 00
               00480 TYPE
                              DEFB
                                       n
                                                         ;Method currently used
8B46 01
               00490
                               DEFB
                                       1
                                                         ; Rethod chosen by M command
               00500
               00510 ;
               00520 ; ADDITIONAL COMMANDS
               00530
               00540
               00550 CORR
8B47
                               EQU
7428
               00560
                               ORG
                                       7428B
7428 C3478B
               00570
                               JP
                                       COMM
               00580
8B47
                               ORG
                                       COMM
8847 215E8B
               00590
                               LD
                                       HL, TABLE
884A 0606
               00600
                               LD
                                       B, 6
                                       (RL)
                                                         ; First letter of command
8B4C BE
               00610 NEXT1
                               CP
8B4D 23
               00620
                               INC
                                       HL
8B4E 5E
               00630
                                       E, (HL)
                                                         ;Low byte
                               LD
8B4F 23
               00640
                               INC
                                       HL
                                       D, (RL)
                                                         ;and high byte of address
8850 56
               00650
                               LD
8B51 23
               00660
                               INC
                                       RL
8852 2002
               00670
                                       NZ, MORE
                               JR
8B54 D5
               00680
                               PUSH
                                       DE
8855 C9
               00690
                               RET
8956 10F4
               00700 HORE
                               DJNZ
                                       NEXT1
                                       BL,47A2B
               00710
8B58 21A247
                               LD
                                                         :Error
                                       472BH
8B5B C32B47
               00720
                               JP
                                                         ; Hethod command
                                        ' M '
895E 4D
               00730 TABLE
                               DEFB
8B5F 708B
               00740
                               DEFW
                                       RETHOD
8861 00
               00750 X
                               DEFB
                                                         ;Eventually X
                                       0
                               DEFB
                                       Ω
8B62 00
               00760
8B63 00
               00770
                               DEFB
                                       ٥
               00780 Y
                                       0
                                                         ;Eventually Y
8B64 00
                               DEFB
                                       0
8865 00
               00790
                               DEFB
8B66 00
               00800
                               DEFB
                                       Ω
               00810 J
8B67 00
                               DEFB
                                       0
                                                         ;Eventually J
8B68 00
               00820
                               DEFB
                                       0
                                       0
8869 00
               00830
                               DEFB
8B6A 00
               D0840
                               DEF8
                                       O
                                                         ; Available for future expansion
8B6B 00
               00850
                                       O
                               DEFB
8B6C 00
                                       0
               00860
                               DEFB
886D 00
               00870
                               DEFB
                                       O
                                                         ; Available for future expension
8B6E 00
               00880
                               DEFB
                                       0
8B6F 00
               00890
                               DEFB
               00900;
                                                                                       Program continues
               00910 ;
```

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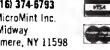


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```
00920 ; CHOOSE KEYBOARD ENTRY METHOD
               00930 ;
               00940
8B70 CDBB49
               00950 METHOD CALL
                                        49BBH
                                                          ;Get next buffer letter
8B73 2812
               00960
                               JR
                                        Z,OH
8B75 0600
               00970
                               LD
                                        B, 0
8B77 FE30
               00980
                               CP
                                        30H
8B79 280F
               00990
                               JR
                                        Z,FIX1
8B7B 0601
               01000
                               LD
                                        B.l
8870 FE31
               01010
                               CP
                                        31H
8B7F 2809
                                        z,FIX1
                01020
                               JR
8B81 0602
                01030
                               LD
                                        B, 2
BB83 FE32
8B85 2807
                01040
                               CP
                                        32H
                01050
                               JR
                                        Z,FIX2
8B87 C3F4BB
                01060 OH
                                        BAD
                               JP
8B8A 3E61
                                                          ;Upper case only
                01070 FIX1
                               LD
                                        A,97
8B8C 1802
                01080
                               JR
                                        OHH
8B8E 3E80
                01090 FIX2
                               LD
                                        A,128
                                                           ;Lower case
8B90 324A46
                01100 OHH
                               LD
                                        (464AH),A
8893 78
                01110
                               LD
                                        A.B
8B94 32468B
                01120
                               LD
                                         (TYPE+1),A
8B97 C9
                01130
                               RET
                01140 ;
                01150 ;
                01160 ; CODE TO DETECT AM COMMAND
                01170
                01180
8B9B
                01190 AM
                               EQU
                                        7618H
7618
                01200
                               ORG
7618 988B
                01210
                               DEFW
                                        AM
8B98
                01220
                               ORG
                                         AM
8B98 E5
                01230
                                PUSH
                                        HL.
8B99 D5
                01240
                               PUSH
                                        DE
8B9A C5
                01250
                                PUSH
                                        BC
8B9B F5
                01260
                               PUSH
                                        A.
8B9C CDBB49
                               CALL
                                         49BBH
                01270
                                                           ; Next command letter
8B9F 2807
                01280
                                JR
                                        Z, ABORT
                                                           ; No next letter
8BA1 FE4D
                01290
                               CP
                                         4 DH
                                                           7 M
                                                                                            Program continues
```

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8 BA3	2816	01300		JR	Z, NEXT		
8 BA 5	CDAF8B	01310	ABORT1	CALL	RETN		
BBAS	F1	01320	ABORT	POP	AF		
8BA9	C1	01330		PDP	BC		
8 BA#	N D1	01340		POP	DE		į
8 BAE	E1	01350		PDP	HL		
	C3E351	01360		JP	ASSEM1	:Assembler routine	
8BAF	21AA41	01370	RETN	LD	HL,41AAH	:Return letter to input buffer	
8BB2	34	01380		INC	(HL)	•	
8BB3	2AA841	01390		LD	HL, (41A8H)		
8BB6		01400		DEC	HL		
8BB7	22A841	01410		LD	(41A8H),HL		
8BBA	C9	01420		RET			
8BBB	213D43	01430	NEXT	LD	HL,433DH	; Cassette output to ASSEM rout	ine
8BBE	36C9	01440		LD	(HL),0C9H	,	
8BCC	218943	01450		LD	HL,4389H		
8BC3	36C3	01460		ĹD	(HL),0C3H		
8BC5	210FBA	01470		LD	HL, ASSEM		
BBC	22BA43	01480		LD	(438AH), HL		
8 BCE	CDBB49	01490		CALL	49BBH	; Next letter	
8 BCE	28D8	01500		JR	Z,ABORT	;No letter	
8 BD 0	FE2B	01510		CP	2 BH	;+	
8BD2	20D1	01520		JR	NZ,ABORT1	;Replace letter	
8 BD4	CDE28B	01530		CALL	ROUT	;High byte of addition to memo	ry
8 BD 7	321A8B	01540		LD	(ADD+1),A	-	•
8BDA	CDE2BB	01550		CALL	ROUT	;Low byte of addition to memor	у
8 BDD	3219BB	01560		LD	(ADD),A		-
8BE0	1BC6	01570		JR	ABORT	;Go to assembler	
8BE2	CDF08B	01580	ROUT	CALL	GET	;Next letter	
8BE5	57	01590		LD	D, A		
8BE6	CDF08B	01600		CALL	GET	;Next letter	
8BE9	5F	01610		LD	E,A		
8BEA	CDFA8B	01620		CALL	CONV	;Convert ascii DE to number	
8BEI	2805	01630		JR	Z,BAD	;DE not correct	
8BEF	' C9	01640		RET			
8BFC	CDBB49	01650	GET	CALL	49BBH	;Next letter	
8BF3	CO	01660		RET	NZ		
8BF4	21A247	01670	BAD	LD	HL,47A2H	;Error	Program continues

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8BF7 C32B47 01680 JP 472BH	1
8BFA C5 01690 CONV PUSH BC ;Convert ascii in DE to number in	l
8BFB 7A 01700 LD A,D ;A and set zero flag if error	l
8BFC CD138C 01710 CALL CONVI	ļ
8BFF 280F 01720 JR Z,BAD1	ł
8C01 57 01730 LD D, A	
8CO2 7B 01740 LD A, E	
8C03 CD138C 01750 CALL CONV1	,
8C06 2808 01760 JR Z,BAD1	
8C08 0610 01770 LD B,16	
8COA 82 01780 ADA ADD A,D	
8COB 10FO 01790 DJNZ ADA	
8COO 04 01800 INC B ;Reset zero flag	
8COE C1 01810 POP BC	İ
8COF C9 01820 RET	
8C10 AF 01830 BAD1 XOR A ;Set zero flag	
8C11 C1 01840 POP BC	
8C12 C9 01850 RET	
8C13 E5 01860 CONV1 PUSH HL ;Convert ascii in A to number	
8C14 C5 01870 PUSH BC ;in A and set zero flag if error	r
8C15 212B8C 01880 LO HL, TABLE1	
8C18 0610 01890 LD B,16	
8Cla BE 01900 LOOP CP (HL)	l
8ClB 2808 01910 JR 2,YES	
8ClD 23 01920 INC HL	ļ
8C1E 23 01930 INC HL	
8C1F 10F9 01940 DJNZ LOOP	
8C21 AF 01950 XOR A ;Set zero flag	
8C22 Cl 01960 POP 8C	
8C23 El 01970 POP HL	
8C24 C9 01980 RET	
8C25 23 01990 YES INC HL	
8C26 7E 02000 LD A, (HL)	
8C27 04 02010 INC B ;Reset zero flag	
8C28 C1 02020 POP BC	
8C29 E1 02030 POP HL	ram continues
8C2A C9 02040 RET	, a commocs



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8C2B 30	02050 T/	ABLE1 DEFB	'0'
8C2C 00	02060	DEFB	o l
8C2D 31	02070	DEF8	111
8C2E 01	02080	DEFB	1
8C2F 32	02090	DEFB	ï2'
8C30 02	02100	DEFB	2
8C31 33	02110	DEFB	131
8C32 03	02120	DEFB	3
8C33 34	02130	DEFB	'4'
8C34 04	02140	DEFB	4
8C35 35	02150	DEFB	'5'
8C36 05	02160	DEFB	5
8C37 36	02170	DEFB	5 '6'
8C38 06	02180	DEFB	· ·
8C39 37	02190	DEFB	'7'
8C3A 07	02200	DEFB	7
8C3B 38	02210	DEFB	'8'
8C3C 08	02220	DEFB	8
8C3D 39	02230	DEFB	'9'
8C3E 09	02240	DEFB	9
8C3F 41	02250	DEFB	'A'
8C40 0A	02260	DEFB	10
8C41 42	02270	DEFB	'B'
8C42 0B	02280	DEFB	11
8C43 43	02290	DEFB	'C'
8C44 0C	02300	DEFB	12
8C45 44	02310	DEFB	יםי
8C46 0D	02320	DEFB	13
8C47 45	02330	DEFB	, E,
8C48 0E	02340	DEFB	14 'F'
8C49 46	02350	DEFB	-
8C4A OF	02360	DEFB	15
	02370 ;		
	02380 ;	POPOUNCE	
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```
02410 ;
8C4B
                02420 DEB
                                EOU
7107
                02430
                                ORG
                                         7107H
7107 C34B8C
                02440
                                JΡ
                                         DEB
8C4B
                02450
                                ORG
                                         DEB
                02460
                                PUSH
8C4B C5
                                         BC
8C4C 01DF04
                                         BC, 4DFH
                02470
                                UD
8C4F 0B
                02480 HERE
                                DEC
                                         BC
8C50 78
                02490
                                         A,B
                                LD
8C51 B1
                02500
                                OR
                                         C
8C52 20FB
                02510
                                JR
                                         NZ, HERE
8C54 C1
                02520
                                POP
                                         8C
8C55 0A
                02530
                                LD
                                         A, (BC)
8C56 A3
                02540
                                AND
                                         E
8C57 C8
                02550
                                RET
8C58 7A
                02560
                                         A,D
                                ĹD
8C59 07
                02570
                                RLCA
8C5A 07
                02580
                                RLCA
8C5B C30A44
                02590
                                JP
                                         440AH
                02600 ;
                02610
                      ; CHANGE 'READY CASSETTE' TO 'MOVE CODE'
                02620
                02630
                02640
8C5E
                02650 COHT1
                                EQU
                                         75E4H
75E4
                02660
                                ORG
                                         'M'
75E4
     4D
                02670
                                DEF8
75E5 4F
                                         101
                02680
                                DEFB
75E6
     56
                02690
                                DEP8
                                         'V'
                                         ' E '
75E7
      45
                02700
                                DEFB
75E8 20
                02710
                                DEF8
                                         'C'
75E9 43
                02720
                                DEFB
                                         101
75EA
     4F
                02730
                                DEF8
                                         1 D 1
75EB 44
                02740
                                DEFB
                                         'E'
75EC 45
                02750
                                DEFB
75ED BF
                02760
                                DEFB
                                         '?'+128
0000
                02770
                                END
00000 TOTAL ERRORS
```



```
Program Listing 4. EDTASM 4
               00100 ; INSTRUCTIONS: Run EDTASM3, enter the text below, and assemble
               00110 ;
                                                   Return to DOS and enter
                       it into memory using AM.
                       DUMP EDTASM4/CMD (START=X'7000', END=X'8D66', TRA=X'8A00').
               00120
               00130
               00140
               00150
                     ; CLEAR KEY
               00160
               00170
                     ; Owners of Version 1.2 should change UP1 to 4C76R, DOWN1 to
               00180
               00190
                       4C7BH, and ED to 4DC5H.
4C72
               00200 UP1
                              EQU
                                       4C72H
                                       4C74H
4C74
               00210 DOWN1
                              EQU
4DC1
               00220 ED
                              EQU
                                       4DC1H
8C5E
               00230 CDHT1
                              EQU
                                       8C5 EH
8B45
               00240 TYPE
                              EQU
                                       8B45H
7663
               00250
                              ORG
                                       7663H
7663 C3
               00260
                              DEFB
                                       GC3H
7664 5E8C
               00270
                              DEFW
                                       CONTI
               00280
                              ORG
                                       CONTI
8C5E
8C5E FE58
               00290
                              CP
                                       5BH
                                                        ;Instruction replaced by JP
8C60 CA6B49
               00300
                              JΡ
                                       Z,496BH
BC63 FE1F
               00310
                              CP
                                       1FH
                                                        ;Clear key
BC65 C26749
               00320
                              JР
                                       NZ,4967H
8C68 CD6E8C
               00330
                              CALL
                                       CLEAR
8C6B C3DA46
               00340
                              JΡ
                                       46DAH
               00350 CLEAR
                              LD
8C6E 3E1C
                                       A,1CH
                                                        ;Routine to clear acreen
8C70 CD3947
               00360
                              CALL
                                       4739H
               00370
8C73 3E1F
                              LD
                                       A,lfH
8C75 CD3947
               00380
                              CALL
                                       4739H
8C78 3E0E
               00390
                              ĹD
                                       A,0EH
               00400
                              CALL
8C7A CD3947
                                       4739H
BC7D C9
               00410
                              RET
               00420
               00430
               00440 ; DOWN ARROW
               00450
               00460 ;
                                                                                           Program continues
```

```
8C7E
                00470 DOWN
                               EQU
                                         7624H
7624
                00480
                               ORG
7624 7E8C
                00490
                               DEFW
                                        DOWN
8C7E
                00500
                               ORG
                                        DOWN
8C7E 3EOP
                                         A,OFH
                00510
                               LO
                                                           ;Cursor off
8C80 CD3947
                00520
                               CALL
                                         4739H
BC83 3E18
                00530
                               LD
                                         A,18H
                                                           ;Upward linefeed
8C85 CD3947
                00540
                               CALL
                                         4739H
8C88 CD744C
                00550
                               CALL
                                        DOWN1
                                                           ;Unmodified command
8C8B 3E0E
                00560
                               LD
                                         A,0EH
                                                           ;Cursor on
8C8D C33947
                00570
                               JP
                                         4739H
                00580
                00590 ;
                00600 ; UP ARROW
                00610
                00620
8C90
                00630 UP
                               EQU
7621
                00640
                               ORG
                                        7621H
7621 908C
                00650
                               OEFW
                                        HP
8C90
                00660
                               ORG
                                         UP
8C90 061C
                00670
                               LD
                                         B, 28
8C92 C5
                00680 LOOP1
                               PUSH
                                         BC
8C93 CD724C
                00690
                               CALL
                                         UPl
                                                           ;Previous line
8C96 C1
8C97 10F9
                00700
                               POP
                                         ВC
                00710
                               DJNZ
                                        LOOP1
8C99 CD6E8C
                00720
                               CALL
                                        CLEAR
8C9C C32A4C
                00730
                               JΡ
                                         4C2AH
                                                           ;Print page
                00740
                00750 ;
                00760 ; SET E=0 AT START OF LINE ENTER ROUTINE
               00770
                00780
8C9F
                00790 E1
                               EQU
7644
                00800
                                        7644H
                               ORG
7644 C3
                00810
                               DEFB
                                         0C3H
7645 9F8C
                00820
                                         E1
                               DEFW
8C9F
                00830
                               ORG
                                         EΙ
8C9F 22A841
                00840
                                         (41A8H),HL
                               LD
                                                           ;Inatruction replaced by JP
8CA2 1E00
                00850
                               LD
                                         E.0
8CA4 C34749
                00860
                               JΡ
                                         4947H
                00870
               00880;
                00890 ;
                        CONVERT TO CORRECT METHOD AT START OF INSTRUCTION
                00900
                00910
8CA7
                00920 C1
                               EQU
73FB
               00930
                               ORG
                                         73FBH
73FB C3
                00940
                               DEFB
                                         0C3H
73FC A78C
                00950
                               OFFW
                                         C1
8CA7
                00960
                               ORG
                                         Cl
8CA7 3A468B
                00970
                               LD
                                         A, (TYPE+1)
                                                           ; Nethod to be used
8CAA 324588
                00980
                                         (TYPE),A
                               LO
                                                           ;Active method
8CAD CD8849
                00990
                               CALL
                                         4988H
                                                           ;Instruction replaced by JP
8C80 C3FE46
                01000
                               JP
                                         46FEH
                01010
                01020 ;
                01030 ;
                        REVISE KEYBOARD ENTRY NETHOD
                01040
                01050
8CB3
                01060 K
                               EQU
7681
                                         7681H
                01070
                               ORG
7681 C3
                01080
                               DEFB
                                         0C3H
7682 838C
                01090
                               DEFW
8C83
                01100
                               ORG
8C83 3A4588
8C86 FE00
                01110
                               LD
                                         A, (TYPE)
                01120
                               CP
                                         0
8CB8 2860
                01130
                               JR
                                         Z, BACK
8CBA FE01
                01140
                               CP
8CBC 2063
                01150
                               JR
                                         NZ, TWO2
8CBE 7E
                01160
                               LO
                                         A, (HL)
                                                           ;Letter from keyboard
                                         3 BH
8CBF FE3B
                01170
                               CP
                                                           ;";
8CC1 2004
                01180
                               JR
                                         NZ, EXT
8CC3 1E04
8CC5 1853
                01190
                               LO
                                         E,4
                                                           ;Stop fiddling around
                01200
                               JR
                                         BACK
                                         27 H
8CC7 FE27
                01210 EXT
                               CP
8CC9 2004
                01220
                               JR
                                         NZ, EXT1
                01230
8CC8 1E04
                               LD
                                         E,4
8CCD 184B
                01240
                               JR
                                         BACK
8CCF PE20
                01250 EXT1
                               CP
8CD1 2815
                01260
                                         Z, EXT3
                               JR
8CO3 PE09
                01270
                               CP
                                         9
                                                           ;Tab
8CD5 2008
                01280
                               JR
                                         NZ, EXT2
8CD7 1C
                01290
                               INC
                                                           ;Next column
                                                                                          Program continues
```

```
8CD8 3E00
               01300 NEW
                               LD
                                        A,0
8CDA 32208D
                01310
                               LD
                                        (NUNBER), A
                                                          ;Count letters in column
8CDD 1838
               01320
                               JR
                                        BACK
                01330 EXT2
                                        A, (NUMBER)
8CDF 3A208D
                               LD
                                                          ;Additional letter in column
8CE2
               01340
                               INC
8CE3 32208D
               01350
                               LD
                                        (NUMBER), A
                               JR
                01360
8CE6 1832
                                        BACK
8CE8
     10
                01370 EXT3
                               INC
                                        E
                                                          ; New column
8CE9 7B
                01380
                               LD
                                        A, E
8CEA FE03
               01390
                               СP
                               JR
                                        NC, EXT4
8CEC 3004
               01400
                                                          ; Already in third or fourth column
                                         (RL),9
ECEE 3609
                01410
                               LD
                                                          ;Tsb instead
8CF0 18E6
               01420
                               JR
                                        NEW
                               СP
8CF2 FE03
               01430 EXT4
8CF4 2802
               01440
                               JR
                                        Z.EXT5
                                                          ;In third column now
8CF6 1822
               01450
                               JR
                                        BACK
BCF8 1C
                01460 EXT5
                               INC
                                        (RL),9
8CF9 3609
                01470
                               LD
                                                          ;Tsb
BCFB 3E09
               01480
                                        A, 9
                               LD
                                        4739R
8CFD CD3947
                01490
                               CALL
                                                          ;Print on screen
8D00 3A208D
                01500
                               LD
                                        A, (NUMBER)
BD03 FE08
                01510
                               CP
                                        NC, EXT6
                               JR
8D05 3010
               01520
                                                          ;At least 8 characters in column
               01530
8D07 23
                               INC
                                        BL
8D0E 3609
                01540
                               LD
                                        (HL),9
                                                          ;Another tab
8D0A 3E09
                01550
                               LD
                                        A,9
47391
                01560
                               CALL
8D0C CD3947
                                                          ;Print on acreen
8D0F 23
               01570
                               INC
                                        NL
8D10 14
                01580
                               INC
                                        D
8D11 14
                01590 KK
                               INC
                                        D
8D12 3E3B
                                        A,3BN
                                                          ; '; '
               01600
                               LD
8D14 C36249
               01610
                               J₽
                                        4962N
8D17 23
                01620 EXT6
                               INC
                                        НL
8D18 18F7
               01630
                               JR
                                        ĸĸ
8D1A 7E
               01640 BACK
                                        A, (BL)
                               LD
8D1B 23
               01650
                               INC
                                        RL
8D1C 14
               01660
                               INC
8D1D C38449
               01670
                               JР
                                        4984H
8D20 00
                01680 NUMBER
                               DEFB
                                        0
                                                          :Number of characters in column
8D21 1C
               01690
                      TWO2
                               INC
                                        E
8D22 7B
                01700
                               LD
                                        A.E
8D23 FE39
               01710
                               CP
                                        39H
                                                          ; If end of line, make line feed
8D25 3806
               01720
                               JR
                                        C, EXT7
                01730
                               LD
                                        A, (NL)
                                                          ;Current character
8D27 7E
8D28 CD3947
               01740
                               CALL
                                        4739H
                                                           ;Print on screen
                                                          ;Line feed
8D2B 1814
               01750
                               JR
                                        LINE
8D2D 7E
               01760 EXT7
                               LD
                                        A, (HL)
8D2E FE20
               01770
                               СP
8D30 280A
               01780
                               JR
                                        Z, EXT8
                                                          ;Tab
                               CP
8D32 FE09
               01790
8D34 20E4
               01800
                               JR
                                        N2, BACK
8D36 7B
                01B10
                               LD
                                        A, E
8D37 C607
                               ADD
                01820
                                        Α,7
8D39 5F
                01830
                               LD
                                        E,A
8D3A 18DE
                01B40
                                        BACK
                               JR
8D3C 78
                01850 EXT8
                               LD
                                        A, E
                                                          ;Look for line feed after 4B characters
8D3D FE30
                               CP
                                        30H
               01860
8D3F 38D9
               01870
                               JR
                                        C, BACX
8D41 23
               01880 LINE
                               INC
                                        NL
8D42 14
               01890
                               1NC
                                        D
8D43 C37549
               01900
                               JΡ
                                        4975K
                                                           :Line feed
                01910
               01920
                      ; REVISE KEYBOARD ENTRY TO ACCOUNT FOR BACKSPACE
               01930
               01940
                01950
8D46
                01960 R1
                               EQU
                                        769DH
769D
               01970
                               ORG
769D C3
               01980
                               DEFB
                                        0C3N
769E 468D
                01990
                               DEFW
                                        RI
               02000
                               ORG
                                        R1
8D46
                02010
8D46 3A458B
                               LD
                                        A, (TYPE)
8D49 FE02
                02020
                               ĊР
8D4B 2001
               02030
                               JR
                                        NZ,S1
8D4D 1D
                02040
                               DEC
                                        E
                                                           ;Backspace
8D4E 15
               02050 S1
                               DEC
                                        ח
                                                           ; Instructions replaced by JP
                02060
8D4F E1
                               POP
                                        HL
               02070
8D50 C9
                               RET
8D51
               02080 R2
                               EQU
76B8
                02090
                               ORG
                                        7688H
76B8
     C3
               02100
                               DEFB
                                        OC3N
     518D
76B9
                02110
                               DEFW
                                        R2
8D51
               02120
                               ORG
                                        R2
                                                                                         Program continues
```



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```
8D51 3A4588
               02130
                               LD
                                        A, (TYPE)
8D54 FE02
               02140
                               CP
8D56 2004
8D58 7B
               02150
                               JR
                                        NZ,S2
                                                          :Backspace past tab
               02160
                               LD.
                                        A,E
8D59 D607
               02170
                               SUB
                                        E,A
8D5B 5P
               02180
                               LD
                                        BC
                                                          ; Instructions replaced by JP
8D5C C1
               02190 S2
                               POP
                               POP
8D5D E1
               02200
                                        HL
8D5E C9
               02210
                               RET
               02220
               02230 :
               02240 ; USE METROD ZERO FOR EDIT COMMAND
               02250
               02260
8D5F
               02270 EDITOR
                               EQU
                                        7627M
                               ORG
7627
               02280
7627 5F8D
               02290
                               DEFW
                                        EDITOR
                02300
                                        EDITOR
8D5F
                               ORG
8D5F AF
                02310
                               XOR
8D60 3245BB
                                         (TYPE),A
               02320
                               LD
8D63 C3C14D
                02330
                               JP
                                        ED
                02340 CONT2
                               EQU
                                         $
8D66
0000
                02350
                               END
00000 TOTAL ERRORS
```

```
Program Listing 5. EDTASM 5
               00100 ; INSTRUCTIONS:
                                       Run EDTASM4, enter the text below, and assemble
                                       Return to DOS and enter BASIC2; answer MEMORY SIZE
               00110 ; it to memory.
                                      Issue the SYSTEM command and reapond to the prompt
               00120 ; with RETURN.
                                      You will automatically return to DOS. Enter
               00130 ; with /40960.
               00140 ; DUMP EDTASM5/CMD (START=X'7000', END=X'9236', TRA=X'8A00').
               00150
               00160 :
               00170 ; ENABLE P COMMAND WHEN BUFFER EMPTY
               00180
               00190
               00200 ; Owners of Version 1.2 should change BEGIN to 5CFOR and SIZE to
               00210
                       1310H.
5CF9
               00220 BEGIN
                              EQU
                                       5CF9H
1307
               00230 SIZE
                              EQU
                                       1307H
               00240 EDITOR
8D5F
                              EQU
                                       8D5FM
8D66
               00250 CONT2
                              EQU
                                       8D66R
8C2B
               00260 TABLE1
                              EQU
                                       8C2BH
               00270 RETN
                              EQU
                                       8BAFH
8BAF
                              EQU
8B61
               00280 X
                                       8B61H
8B64
               00290 Y
                              EQU
                                       8B64H
               00300 J
8B67
                              EQU
                                       8B67M
               00310
                              ORG
                                       7605B
7605
                                       1 E 1
7605 45
               00320
                              DEPB
                                                        ;Interchange E
7606 5F8D
               00330
                              DEFW
                                       EDITOR
7626
               00340
                              DRG
                                       7626H
7626 50
                                       'P'
                                                        and P commands
               00350
                              DEPR
                                       CONT2
7627 668D
               00360
                              DEFW
741F
               00370
                              ORG
                                       741FH
741F 05
               00380
                              DEFB
                                                        ;Additional command with buffer empty
               00390 ;
               00400
               00410 ; PEEK AND POKE
               00420 ;
               00430
                                       CONT2
8D66
               00440
                              ORG
8D66 CDBB49
               00450
                              CALL
                                       49BBH
                                                        ; Next letter
8D69 280B
               00460
                              JR
                                       Z, ABORT2
               00470
                                       101
                              CP
8D6B FE4F
8D6D 2825
               00480
                              JR
                                       Z, POKE
8D6F PE45
               00490
                              CP
                                       E
8D71 2841
               00500
                              JR
                                       Z, PEEK
                              CALL
               00510
                                       RETN
                                                        ;Return letter to buffer
8D73 CDAF8B
               00520 ABORT2
                                       HL, (4115H)
8D76 2A1541
                              LD
                                                        ;Buffer empty?
8D79 11F95C
               00530
                              LD
                                       DE, BEGIN
8D7C CDC24B
               00540
                              CALL
                                       4BC2H
                                                        :DE = BC?
8D7F 2006
                                       NZ, PRI
               00550
                              JR
                                                        ;No text in buffer
8D81 21C647
               00560
                              LD
                                       HL,47C6R
8D84 C32B47
               00570
                              JΡ
                                       472BH
8D87 C32A4C
               00580 PRI
                              JP
                                       4C2AH
                                                        :Print routine
               00590 LETTER
                                                        ;Next letter
8D8A CDBB49
                              CALL
                                       49BBH
8D8D C0
               00600
                              RET
                                       NZ
```

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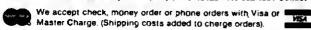


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```
BD8E 21A247
                00610 ERR4
                               LD
                                        HL,47A2H
                                                           :Error
8D91 C32B47
                00620
                               JP
                                         472BH
BD94 CD8A8D
                00630 POKE
                                CALL
                                        LETTER
8D97 FE4B
                00640
                               CP
                                         'K'
8D99 20F3
                00650
                                        NZ, ERR4
                               JR
BD9B CD8ABD
                00660
                                CALL
                                        LETTER
8D9E FE45
                00670
                               CP
                                         'E'
BDA0 20EC
                00680
                               JR
                                        NZ, ERR4
8DA2 CD098E
                00690
                               CALL
                                        SUB4
                                                           ;HL = address
BDA5 CD8A8D
                00700
                               CALL
                                        LETTER
BDA8 FE2C
                00710
                               CP
8DAA 20E2
                00720
                                JR
                                        NZ.ERR4
8DAC CDD48D
                00730
                                CALL
                                        SUB1
                                                          ;DE = ascii of value
8DAF CDE18D
                00740
                               CALL
                                         SUB2
                                                           ;A = value
BDB2 77
                00750
                                LD
                                         (HL),A
                00760
8DB3 C9
                                RET
BDB4 CD8A8D
                00770 PEEK
                                        LETTER
                                CALL
BDB7 FE45
                007B0
                                         'E'
                               CP
8DB9 20D3
                00790
                                JR
                                        NZ, ERR4
8DBB CD8A8D
                00800
                                CALL
                                         LETTER
BDBE FE4B
                00810
                               CP
                                         'K'
8DC0 20CC
                00820
                                JR
                                         NZ, ERR4
8DC2 CD098E
                00830
                                CALL
                                         SUB4
                                                           ; HL = address
BDC5 7E
                00840
                               LD
                                        A, (HL)
                                                           ; Value obtained by PEEK
BDC6 CD1BBE
                00850
                               CALL
                                        CONV2
                                                           ;HL = ascii of A
BDC9 7C
                00860
                                LD
                                        A,H
8DCA CD3947
                00870
                                CALL
                                         4739H
                                                           Print on screen
BDCD 7D
                00880
                                LD
                                        A.L
                                         4739H
8DCE CD3947
                00890
                                CALL
                                                           :Print on acreen
BDD1 CDD746
                00900
                                CALL
                                         46D7H
                                                           ;Line feed and return to EDTASM
BDD4 CDBB49
                00910 SUB1
                                CALL
                                         49BBH
                                                           ;Subroutine gets two letters from
8DD7 28B5
                00920
                                JR
                                         Z, ERR4
                                                           ; input buffer and loads them
                                        D,A
8DD9 57
                00930
                                LD
                                                           :into DE
                00940
BDDA CDBB49
                                CALL
                                         49BBH
8DDD 28AF
                00950
                                JR
                                         Z, ERR4
8DDF 5F
                00960
                                LD
                                         E,A
BDEO C9
                00970
                                RET
8DE1 C5
                00980 SUB2
                                PUSH
                                         BC
                                                           ;Subroutine takes two ascii hex
8DE2 7B
                00990
                                LD
                                         A,E
                                                           ;digits in DE and returns the
8DE3 CDF48D
                01000
                                CALL
                                         SUB3
                                                           ; value of this number in A
8DE6 5F
8DE7 7A
                01010
                                LD
                                         E,A
                01020
                                LD
                                         A.D
BDEB CDF48D
                01030
                                CALL
                                         SUB3
8DEB 57
8DEC 7B
                01040
                                LD
                                        D,A
                01050
                                LD
                                         A,E
BDED 0610
                01060
                                LD
                                         B, 16
                01070 AHAA
8DEF 82
                                ADD
                                         A,D
8DF0 10FD
                01080
                                DJNZ
                                         AHAA
8DF2 C1
                01090
                                POP
                                         BC
8DF3 C9
                01100
                                RET
BDF4 E5
                01110 SUB3
                                PUSH
                                         HL
                                                           ;Subroutine converts A from ascii
                                PUSH
8DF5 C5
                01120
                                         BC
                                                           ; number to the number itself
8DF6 0610
                01130
                                LD
                                         B,16
8DF8 212B8C
                01140
                                LD
                                         HL, TABLE1
                01150 LOOP2
8DFB BE
                                CP
                                         (HL)
8DFC 23
                01160
                                INC
                                         HL
8DFD 2806
                01170
                                JR
                                         Z,OUT
8DFF 23
                01180
                                INC
                                         HL
8E00 10F9
                                         LOOP2
                01190
                                DJNZ
8E02 C38E8D
8E05 7E
                01200
                                JP
                                         ERR4
                01210 OUT
                                LD
                                         A, (HL)
8E06 C1
                01220
                                POP
                                         BC
8E07 E1
                01230
                                POP
                                         HL
8E08 C9
                01240
                                RET
8E09 CDD48D
                01250 SUB4
                                CALL
                                         SUB1
                                                           ;Subroutine inputs four letters
8E0C CDE18D
                01260
                                CALL
                                         SUB2
                                                           from buffer and puts the
8E0F 67
                01270
                                LD
                                         H.A
                                                           ; corresponding number in HL
8E10 CDD48D
                                CALL
                01280
                                         SUB1
8E13 CDE18D
                01290
                                CALL
                                         SUB2
8E16 6F
                01300
                                T.D
                                         L, A
BE17 C9
                01310
                                RET
8E18 0600
                01320 CONV2
                                LD
                                         B, 0
                                                           ;Subroutine takes number in A
8E1A D610
                01330 LET
                                SUB
                                         16
                                                           ; and converts it to ascii form
8E1C 3803
                01340
                                JR
                                         C, NOW
                                                           ; in HL
8E1E 04
                01350
                                INC
                                         В
8E1F 18F9
                01360
                                JR
                                         LET
8E21 C610
                01370 NOW
                                ADD
                                         A,16
8E23 CD2D8E
                01380
                                CALL
                                         CONV3
8E26 6F
8E27 78
                01390
                                LD
                                         L,A
                01400
                                LD
                                         A,B
                                         CONV3
8E28 CD2D8E
                01410
                                CALL
8E2B 67
                01420
                                LD
                                         H,A
8E2C C9
                01430
                                RET
                                                                                         Program continues
```

8E2D	E5	01440	CONV3	PUSH	HL	;Subroutine converts hex i	n A to
8E2E	C5	01450		PUSH	BC	aBcii in A	
8E2F	212C8C	01460		LD	HL, TABLE1+1		
8E32	0610	01470		LD	8,16		
8E34	4F	01480		LD	C,A		
8E35	7E	01490	LOOP3	LD	A, (HL)		
8E36	89	01500		CP	c´`		
8E37	2807	01510		JR	Z,OUT1		
8E39	23	01520		INC	HL		
8E3A	23	01530		IHC	aL		
8E3B	1078	01540		DJNZ	LOOP3		
8E3D	C38E8D	01550		JP	ERR4		
8E40	28	01560	OUT1	DEC	8L		
8E41	7 E	01570		LD	A, (HL)		
8E42	C1	01580		POP	BC		
8E43	El	01590		POP	HL		
8E44	C9	01600		RET			
		01610	3				
		01620	;				
			: X AND	Y			
		01640	;	_			
		01650	•				
8E45		01660	Ýl	EQU	\$		
8864		01670		ORG	Ÿ		
8B64	59	01680		DEFB	ĪΥ'		
	458E	01690		DEFW	y1		
8E45	•	01700		ORG	Υl		
8E45	21F09C	01710		LD	HL,9CFOH		
	11F95C	01720		LD	DE, BEGIH	Beginning of buffer	
	010713	01730		LD	BC, SIZE	Temporary size of buffer	
		01740			20,0122	eventually 1000H larger	
8E4E	EDB0	01750		LDIR		, eveneually 1000m larger	
	21F95C	01760		LD	BL, BEGIN	;Set top of buffer	
8E53		01770	LOOP4	LD	B, (HL)	, occ cop or putter	
8E54		01780		INC	HL		
8E55		01790		LD	A, H		
	FE80	01800		CP	80H	;Entire memory searched	Out and applied to
	- 201	-2000		~ -		, and it memory sepicifed	Program continues

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```
01810
8E58 280F
                                 JR
                                          Z, ERR5
8E5A 78
                01820
                                 LD
                                          A,B
8E5B FEFF
                01830
                                 CP
                                          OFFH
                                          NZ, LOOP4
8E5D 20F4
                01840
                                 JR
8E5F 7E
                01850
                                 LD
                                          A, (HL)
8E60 FEFF
                01860
                                 CP
                                          OFFH
8E62 20EF
                01870
                                          NZ, LOOP4
                                 JR
8E64 2B
                                 DEC
                01880
                                          HT.
8E65 221541
                01890
                                 LD
                                          (4115H),HL
                                                             ;Top of buffer
8E68 C9
                01900
                                 RET
BE69 21F95C
8E6C 221541
                01910
                       ERR5
                                          HL, BEGIN
                                 LD
                                                             ; Error, so make an empty buffer
                01920
                                 I.D
                                          (4115H), HL
8E6F 36FF
                01930
                                 LD
                                          (HL),OFFH
8E71 23
                01940
                                 INC
                                          Hľ.
8E72 36FF
                01950
                                 LD
                                          (HL), OFFH
8E74 C9
                01960
                                 RET
8E75
                01970 x1
                                 EOU
8B61
                01980
                                          Х
'Х'
                                 DRG
8B61 58
                01990
                                 DEFB
8B62 758E
                02000
                                 DEFW
                                          X1
8E75
                02010
                                 ORG
                                          X 1
8E75 2A1541
                02020
                                 LD
                                          HL, (4115H)
8E78
     23
                02030
                                 INC
                                          HL
8E79 23
                02040
                                 INC
                                          HL
                                                             :End of buffer
8E7A 37
                02050
                                 SCF
8E7B 3F
                02060
                                 CCF
8E7C 11F95C
                02070
                                 LD
                                          DE, BEGIN
8E7F ED52
                02080
                                 SBC
                                          HL, DE
                                                             :Size of buffer
8E81 E5
                02090
                                 PUSH
                                          HL
8E82 E5
                02100
                                 PUSH
                                          HL
8E83
     21F95C
                02110
                                 LD
                                          HL, BEGIN
8E86 11F09C
                02120
                                 LD
                                          DE,9CFOH
8E89 C1
                02130
                                 POP
                                          BC
8E8A EDBO
                02140
                                 LDIR
                                                             ; Hove into high memory
8E8C 21F09C
                02150
                                 ĹD
                                          HL,9CFOH
8E8F D1
                02160
                                 POP
                                          DE
8E90 19
                02170
                                 ADD
                                          HL.DE
                                                             ;Top of high memory
8E91 E5
                02180
                                 PUSH
                                          HL
8E92
     7C
                02190
                                 LD
                                          A,H
8E93 CD18BE
                02200
                                 CALL
                                          CÓNV2
8E96
     7C
                02210
                                 I.D
                                          A,H
8E97
     32C68E
                02220
                                 LD
                                          (DATA),A
8E9A 7D
                02230
                                 LD
                                          A.L
8E9B 32C78E
                                          (DATA+1),A
                02240
                                 LD
8E9E E1
                02250
                                 POP
                                          HL
8E9F 7D
                02260
                                 LD
                                          A,L
8EA0
     CD188E
                02270
                                 CALL
                                          CONV2
     7C
8EA3
                02280
                                 T.D
                                          A.H
     32C88E
8EA4
                02290
                                 LD
                                          (DATA+2),A
8EA7
     7D
                02300
                                 LD
                                          A,L
     32C98E
8EAB
                02310
                                          (DATA+3),A
                                 LD
8EAB 21B18E
                02320
                                          HL, TEXT
                                 I.D
8EAE C32B47
                02330
                                 JP
                                          472BH
8EB1
     28
                02340
                       TEXT
                                 DEFB
8 EB2
     53
                02350
                                          ١ġ١
                                 DEFB
                                          T
8EB3
     54
                02360
                                 DEFB
                                          'A'
8 EB 4
     41
                02370
                                 DEFB
8EB5
     52
                02380
                                           'R'
                                 DEFB
8EB6
     54
                02390
                                          T
                                 DEFB
8EB7
                                          1=1
     3D
                02400
                                 DEFB
8EBB
     58
                02410
                                 DEFB
                                           'X'
8EB9
     27
                02420
                                 DEFB
                                          ...
8EBA
     39
                02430
                                          191
                                 DEFB
                                           'Ĉ'
8EBB
     43
                02440
                                 DEFB
                                          'F'
8EBC 46
                02450
                                 DEFB
8EBD
     30
                02460
                                 DEFB
                                           '0'
8EBE 27
                02470
                                 DEFR
8EBF
     2C
                02480
                                 DEFB
8EC0
     45
                02490
                                 DEFB
                                           'E'
8EC1 4E
                02500
                                 DEFB
                                           N
8EC2
                                           ים י
     44
                02510
                                 DEFB
                                           1 <u>m</u> 1
8EC3
     3D
                02520
                                 DEFB
8EC4 5B
                02530
                                 DEPB
                                           'X'
                                           111
8EC5
     27
                02540
                                 DEFB
8EC6 2A
                02550 DATA
                                           1 ± 1
                                 DEPB
                                           1 🖈 1
8EC7 2A
                02560
                                 DEFB
                                           ...
8 EC 8
     2A
                02570
                                 DEFB
8EC9 2A
                02580
                                 DEFB
                                          1 + 1
                                          111
8ECA 27
                02590
                                 DEFB
8ECB A9
                                          ') '+128
                02600
                                 DEFB
                02610
                02620 ;
                02630
                                                                                              Program continues
```

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```
02640
               02650
BECC
               02660 J1
                               EQU
                                        $
8B67
               02670
                               ORG
8B67 4A
                                        'J'
               02680
                               DEFB
8B68 CC8E
               02690
                                        Jl
                               DEFW
BECC
               02700
                               DRG
                                        Jl
8ECC CDBB49
               02710
                               CALL
                                        49BBH
                                                          ;Next letter
SECF CASESD
               02720
                               JP
                                        Z, ERR4
8ED2 FE55
               02730
                               CP
                                        '0'
8ED4 2004
               02740
                                        NZ, FANCY
                               JR
8ED6 CD098E
               02750
                               CALL
                                        SUB4
8ED9 E9
               02760
                               JΡ
                                        (BL)
SEDA CDAPSS
               02770 FANCY
                               CALL
                                        RETN
8EDD 210040
               02780
                               r.n
                                        HL,4000H
                                                          ;Save bottom of EDTASM
8EE0 11F099
               02790
                               LD
                                        DE,99FOH
8EE3 010003
               02800
                               LD
                                        BC,300H
                               LDIR
SEE6 EDB0
               02810
SEES CD09SE
               02820
                               CALL
                                        SUB4
8EE8 31EF99
               02830
                               LD
                                        SP,99EFH
                                                          ; Put stack elsewhere
SEEE ES
               02840
                               £Χ
                                        DE, HL
SEEF 21018F
               02850
                                        HL, CLEAN
                                                          ;Will return here after jump
                               I.D
8EF2 E5
               02860
                               PUSH
                                        HL
8EF3 D5
               02870
                               PUSR
                                        DE
8EF4 21368F
               02880
                                        HL, BASIC
                                                          ; Put BASIC fixed ROM in position
                               LD
                                        DE,4000H
8EF7 110040
               02890
                               LD
BEFA 010003
               02900
                               LD
                                        BC,300H
               02910
SEFD ED80
                               LDIR
SEFF El
               02920
                               POP
                                        HL
8F00 E9
               02930
                               JΡ
                                        (HL)
8F01 F3
               02940 CLEAN
                               DI
                                                          Return bottom of EDTASM to 4000H
8F02 21F099
               02950
                               LD
                                        HL,99FOH
8F05 110040
               02960
                                        DE,4000H
                               LD
8F08 010003
               02970
                               LD
                                        BC,300H
8F0B EDB0
               02980
                               LDIR
8F0D C3DA46
               02990
                               JP
                                        46DAH
               03000
               03010
                      ; DEBOUNCE ROUTINE FOR BASIC RON
               03020
               03030
               03040
8F10
               03050 BASDEB
                               EQU
8F10 213640
               03060
                               LD
                                        HL,16438
8F13 010138
               03070
                               LD
                                        BC,14337
8F16 1600
               03080
                               LD
                                        D,0
8F18 0A
               03090 LI
                               LD
                                        A, (BC)
8F19 5F
               03100
                               LD
                                        E,A
BF1A AE
                                        (HL)
               03110
                               XDR
8F1B 73
               03120
                               LD
                                        (HL),E
8F1C A3
               03130
                               AND
8F1D 2008
8F1F 14
                                        NZ,NI
               03140
                               JR
               03150
                               INC
                                        D
8F20 2C
               03160
                               INC
8F21 C801
               03170
                               RLC
                                        C
8F23 F2188F
               03180
                               JP
                                        P,LI
8F26 C9
               03190
                               RET
8F27 5F
               03200 NI
                               LD
                                        E,A
8F28 C5
               03210
                               PUSH
                                        BC
8F29 01DF04
               03220
                                        BC, 1247
                               LD
8F2C CD6000
               03230
                               CALL
                                        96
8F2F Cl
                03240
                               POP
                                        8C
8F30 0A
               03250
                               LD
                                        A, (BC)
                03260
8F31 A3
                               AND
                                        E
8F32 C8
               03270
                               RET
                                        Z
8F33 C3FB03
               03280
                               JΡ
                                        1019
BF36
               03290 BASIC
                               EQU
                                        BASIC+300B
9236
               03300 CDNT3
                               EQU
               03310
                03320
               03330 ;
                        TEMPORARY CDDE TO PLACE BASIC IN POSITION
               03340
                03350
A000
                03360
                               DRG
                                        0A000H
A000 21108F
                03370
                               LD
                                        RL, BASDEB
A003 221640
                03380
                               LD
                                         (16406),EL
A006 F3
                03390
                               DI
A007 210040
                03400
                               LD
                                        HL,4000H
                                        DE, BASIC
A00A 11368F
                03410
                               I.D
A00D 010003
                03420
                               LD
                                        BC,300H
A010 ED80
                03430
                               LDIR
A012 C30000
                03440
                               JP
                                        0
0000
                03450
                               END
00000 TOTAL ERRORS
```

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Yes, I want t al \$19.95 ea		or FUN and PROF!	T Please send me	programs
I need a 🗔 T	RS-80 Cassette or	Apple Cassette		
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Card No				Exp date
NAME				
ADDRESS				
CITY		ST#	ATÉ	ZIP

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First successful manufacturer of double headed drives
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The program capitalizes automatically unless you add lowercase. The first letter of each sentence and the word I are slways capitalized. Other characters will be printed in lowercase unless they are entered with SHIFT. The computer begins a sentence when it recognizes a period or question mark followed by two spaces.

TAB indicates the beginning of a new paragraph. TAB should not be used to jump from column to column if you intend to print with TYPE.

M2 and TYPE can be used to create titles and section headings. Enter a title by typing #, the title, and another #. The title will be centered. Since most titles

consist of capital letters, the computer will print UNSHIFTED tetters as capitals and SHIFTED letters in lowercase unless you add the lowercase modification.

The characters ## Inserted into the buffer alone are used to print a blank line.

For housekeeping reasons, the computer will not print initial spaces on a line. It can be made to jump to the middle of a line by entering a tab and then continuing with the appropriate number of spaces.

Several printing parameters can be changed using POKE. A detailed list of printing parameters is given in Table 1. The number of characters on a line, the size of the left margin, and the paragraph indentation can be chosen at will. The computer can be made to single space or double space, it will add an additional line between paragraphs if desired, and it can be made to print titles using wide characters if your printer has that ability.

The program will work with printers as narrow as Radio Shack's 32 column wide Quick Printer II. Obviously, a wider printer is preferable.

Making the Modification

To modify the assembler, follow the instructions at the end of this article. The modification proceeds in stages. First EDTASM is placed on disk using

a famous trick. Next it is given the ability to assemble directly into memory; this step requires a tedious entry of code by hand. From then on, the assembler is used to modify itself. Modification becomes easier and easier as the assembler changes.

There are two versions of ED-TASM, 1.1 and 1.2. If you own version 1.2, pay close attention to the comments which begin sections three, four, and five; they describe a small number of changes you must make in the listed code.

Other comment lines interspersed throughout the code describe changes you may wish to make in startup mode, printer

continuous to page 250

Program Listing 6. EDTASM 6

```
The code below converts the assembler
               00100 ;
                       INSTRUCTIONS(A):
                                           Run EDTASM5.
                       to lower case for readers who have installed Radio Shack's lower
               00110
                     1
               00120
                                              This code will work with most other lower
                       case modification.
                                                                           If you do not have
               00130
                       case modifications; rewrite it if necessary.
                       a lower case modification, go to the next set of instructions.
               00140 ;
                        When the code below is in place, the keyboard will work exactly as it works under Radio Shack's BASIC software. EDT.
               00150 ;
               00160
               00170
                        will power up in upper case mode.
                                                              To convert back and worth
                       between this mode and regular typewriter mode, press SHIFT-ZERO.
               00180 ;
                             The automatic capitolization feature of TYPE is intended
               00190
                                                        If you make the lower case modifi-
               00200
                        for those without lowercase.
               00210
                        cation, TYPE will print exactly what is on the screen.
               00220
               00230
               00240
                       LOWER CASE
               00250
               00260
               00270 CONT3
                               EQU
                                        9236H
9236
8C4F
               00280 HERE
                               EQU
                                        8C4FH
               00290
                                        8B90H
8B90
                      OHH
                               EQU
                                                          ; Keyboard accept all letters
               00300
                               ORG
                                        734AH
734A
734A 80
               00310
                               DEFB
                                        ROH
                                                          ; Cancel "Method" case control
               00320
                               ORG
                                        OHH
8B90
8B90 00
               00330
                               DEFB
8B91 0000
               00340
                               DEFW
                                        717BH
                                                          ;Modify screen routine to print
717B
               00350
                               ORG
717B 18
               00360
                               DEFB
                                        18H
                                                          ; exactly what is received
                                        731AH
                                                          ; Modify keyboard
731A
               00370
                               ORG
731A C3
                                        DC3H
               00380
                               DEFB
731B 3692
                                        CONT3
               00390
                               DEFW
9236
               00400
                               ORG
                                        CONT3
                                                          ;Code replaced by JP
9236 B7
               00410
                               OR
                                        Z.4617H
9237 CA1746
                               JP
               00420
                               PUSH
923A F5
               00430
                                        AF
923B 3A6592
               00440
                               LD
                                        A, (LOWER)
                                                          ; Keyboard mode
               00450
                               CP
923E FE01
                               JR
                                        Z, REGULA
9240 280C
               00460
                               POP
9242 F1
               00470
                                        AΓ
9243 FE61
                                                          ;Shifted letter
               00480
                               CP
                                        61H
9245 3806
               00490
                               JR
                                        C. NOS
9247 FE7B
               00500
                               CP
                                        7BH
                                        NC.NOS
                               JR.
9249 3002
               00510
924B D620
               00520
                               SUB
                                        20 H
924D C9
               00530 NOS
                               RET
               00540 REGULA
                               POP
                                        AF
924E F1
                                                          ;Shifted letter
                               CP
                                        7BH
924F FE7B
               00550
                                        NC, NOS
9251 30FA
               00560
                               JR
9253 FE61
               00570
                               CP
                                        61H
                               JR
                                        C,NOS1
9255 3803
               00580
                                                                                 Program continues
9257 D620
               00590
                               SUB
                                        20H
```



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The following BASIC PROGRAM, written on the TRS-80, was compiled using MICROSOFT'S BASIC COMPILER and SIMUTEK'S BASIC COMPILER. We feel the results speak for themselves!

10 ' SPEED TEST SIMUTEK ZBASIC COMPILER VS. MICROSOFT COMPILER 15 CLS: PRINTAIN, "HIT A KEY WHEN READY TO START TEST"; 20 [\$=[NKEY\$:[FI\$=""THEX20ELSEFORZ=[TO]0: 38 FORX=8T0127:FORY=8TD47:SET(X,Y):NEXTY, X :FDRX=127TOBSTEP-1:FDRY=47TOBSTEP-1:RESET(X,Y) : NEXTY, X: FDRX=1T01800:GOSUB1800:NEXTX, Z 48 CLS:PRINT"FINISHED WITH PROGRAM TEST"::STOP

BASIC,PROGRAM SIZE: 329 BYTES PROGRAM RUN: 22 Minutee, 37 Seconds

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Compiled Size	10057 Bytes	1228 Bytes
Compile Time:	14 Minutes	0 75 Seconds
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FOR	NEXT	STEP	IF	THEN	ELSE	PEEK	ON GOTO
SET	RESET	POINT	CHR5	MODINAR	RND ()	POKE	ON GOSUB
DATA	READ	RESTORE	ENO	GOTO	GOSUB	CLS	ON GOSUB
INPUT	INKEYS	LET	STOP	OUT	INP	RETURN	ON GOSUB
PRINT	LPRINT	MTNIR9	USR	SGN	INT	ABS	
SOR	LEN	ASC	VAL				
INIT M	ATH A	* / AND O	R SOR				

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```
9259 C9
               00600
                               RET
925A FE5B
               00610 NOS1
                               CP
                                        5 B H
                                                           ;Unshifted letter
925C 30EF
                                        NC, NOS
               00620
                               JR
925E FE41
               00630
                               CP
                                        41 H
9260 38EB
               00640
                               JR
                                        C, NOS
                                        A,20H
9262 C620
               00650
                               ADD
9264 C9
               00660
                               RET
9265 00
               00670 LOWER
                               DEFB
                                                           :Keyboard mode
9266
               00680 KEY
                               EOU
                               ORG
                                        HERE+ODH
8C5C
                00690
                                                           ; Immediately after debounce
                                                           ; see if shift-zero is pressed
8C5C 6692
                00700
                               DEFW
                                        KEY
9266
                00710
                               ORG
                                        KEY
                                                           ; if so, change keyboard
9266 F5
9267 7A
                00720
                               PUSR
                                        AF
                                        A,D
                00730
                               LD
                                                           :Zero key
9268 FE04
                00740
                               CP
926A 2016
                00750
                                JR
                                        NZ, NDC
926C 7B
                00760
                                LD
                                        A,E
926D FE01
               00770
                                CP
926F 2011
                00780
                                JR
                                        NZ, NOC
9271 3A8038
                00790
                                LD
                                        A, (3880H)
                                                           ;Shift
9274 FE01
                00800
                                CP
9276 200A
                                        NZ NOC
                00810
                                JR
9278 3A6592
                00820
                                LD
                                        A, (LOWER)
927B EE01
                00830
                                XOR
927D 326592
                00840
                                LD
                                         (LOWER), A
                00850
                                POP
                                         AF
9280 F1
9281 C9
                00860
                                RET
9282 F1
                00870 NOC
                                POP
9283 C30A44
                00880
                                JP
                                         440AH
                00890
                00900
                00910
                      ; INSTRUCTIONS(B): The code below forms a new printer driver.
                00920
                      1 When the driver is in place, you may use both serial and parallel
                                     To convert to the serial printer, POKE 9327,01.
                00930 ; printers.
                00940
                      1 To convert back to the psrallel printer, POKE 9327,00.
                00950
                              The IN and OUT commands in the program refer to the serial
                      - 1
                00960 ; printer. If you do not have a serial printer, keep these
                00980
                              Since printers differ, you may have to make some changes
                      ; in the code. Read the comments sprinkled throughout the text.
                00990
                01000 ;
                              When using this driver, you may press the BREAK key at any
                01010 ; time to stop printing and return to EDTASM. The printer can
                01020 ; type any desired number of lines per page. As written, the
                01030 ; printer will type continuously. To change the number of 101040 ; per page, POKE 932A with the new number of lines (in hex).
                                                              To change the number of lines
                01050 ; The printer will then print this number of lines, skip to the
                01060; next page, and resume printing there. It is assumed that the 01070; total number of possible lines on a page is 66; this number too
                         can be changed by poking 932B with the new number (in hex). To reset the line counter at 0 (top of form), POKE 9329 with 00.
                01080 ;
                01090 ;
                Olloo ; Finally, it is possible to pause at the end of each page if
                01110 ; you are typing on single sheets. To do so, POKE 932C with 01.
                01120 ; Continuous printing without these pauses can be resumed by
                01130 ; poking 932C with 00.
                01140
                01150
                01160 ; SERIAL PRINTER DRIVER
                01170 ;
                01180
9286
                01190 PRINT
                                EQU
                                         CONT3+50H
72AA
                01200
                                ORG
                                         72AAH
72AA C3
                01210
                                DEFB
                                         OC3H
72AB 8692
                01220
                                DEFW
                                         PRINT
9286
                01230
                                ORG
                                         PRINT
9286 3A2793
                01240
                                LD
                                         A, (PTYPE)
9289 B7
                01250
                                OR
                                         Α
928A F5
                                         AF
                01260
                                PUSH
                                         Z, AROUND
928B 2816
                01270
                                JR
928D 3A2893
                01280 SERIAL
                                LD
                                         A, (INIT)
                                                           ;Already initialized?
9290 FE01
                01290
                                CP
                                         Z, AROUND
9292 280F
                01300
                                JR
9294 3E01
                01310
                                LD
                                         A,1
                                                           ; If not, initialize
                                         (INIT),A
9296 322893
                01320
                                LD
9299 D3E8
                01330
                                DUT
                                         (OE8H),A
                                                           :Reset RS-232-C
                01340 ; The next instruction sets the transmission rate at 1200 baud.
                01350 ; Use 55H for 300 baud and 66H for 600 baud. Consult the RS-232
                01360; manual for other values.
01370 LD A,77H
929B 3E77
                                                           ;1200 baud
                                OUT
929D D3E9
                01380
                                         (OE9H),A
                01390 ; The next instruction selects even parity, one stop bit, and
                01400; word length seven. Consult the RS-232 manual for other values.
929F 3EA4
                                         A,OA4H
                01410
                                LD
92A1 D3EA
                01420
                                OUT
                                         (OEAH),A
                                                                                                Program continues
```

```
92A3 F1
               01430 AROUND
                              POP
                                       AF
92A4 CDFA92
               01440
                               CALL
                                       DUTPUT
92A7 FEOD
               01450
                               CP
                                       13
                                                         ; Carriage return
92A9 CO
               01460
                              RET
                                       NZ
               01470 ; Replace the next command with NOP, NOP if your printer doze
               01480 ; not issue eutomatic line feeds after carriage returns.
92AA 1805
               01490
                              JR
                                       AR3
92AC 0E0A
               01500
                               LD
                                       C,10
                                                         :Line feed
92AE CDFA92
                                       OUTPUT
               01510
                              CALL
                                       A, (PAGE)
92B1 3A2A93
               01520 AR3
                              LD
92B4 47
               01530
                               LD
                                       B, A
92B5 3A2993
               01540
                               LD
                                       A, (LINE1)
     3 C
               01550
                               INC
92B8
92B9 322993
               01560
                               LD
                                       (LINE1),A
                               СP
92BC B8
               01570
                                       В
                               RET
92BD C0
               01580
                                       NZ
92BE 3A2B93
               01590
                               LD
                                       A, (TOTAL)
92C1 90
               01600
                               SUB
                                       В
92C2 B7
                               OR
               01610
92C3 280F
               01620
                               JR
                                       Z,AR4
92C5 47
               01630
                               LD
                                       B, A
92C6 0E0D
               01640 ARS
                               LD
                                       C,13
                              CALL
                                       OUTPUT
92C8 CDFA92
               01650
               01660
                     ; Replace the next command with NOP, NOP if your printar does
               01670 ; not issua autometic line feeds after cerriaga returns.
92CB 1805
               01680
                               JR
                                       AR6
92CD OEOA
               01690
                               LD
                                       C,10
92CF CDFA92
               01700
                               CALL
                                       OUTPUT
92D2 10F2
               01710 AR6
                               DJNZ
                                       AR5
9204 3E00
               01720 AR4
                                       A,0
                               LD
                               LD
                                       (LINE1),A
92D6 322993
               01730
                                       A, (PAUSE)
92D9 3A2C93
               01740
                               LD
               01750
920C FE01
                               CP
               01760
                               RET
92DE C0
                                       NZ
92DF 3A4038
               01770 AR7
                                       A, (3840H)
                               LD
92E2 FE04
               01780
                               CP
                                                         ; 8 reak
92E4 CADA46
               01790
                               JΡ
                                       Z,46 DAN
               01800
                               СP
92E7 FE01
                                                         ;Enter
92E9 C8
               01810
                               RET
92EA PE80
               01820
                               СP
                                       128
                                                         ; Space
92EC CB
               01830
                               RET
                                       AR7
               01840
92ED 18F0
                               JR
92EF F5
               01850 BREAK
                               PUSH
                                       AF
92F0 3A403B
               01860
                               LD
                                       A, (3B40H)
92F3 FE04
               01870
                               CP
92P5 CADA46
               01880
                               JP.
                                       Z,46DAH
92F8 F1
               01890
                               POP
                                       AF
92F9 C9
               01900
                               RET
92FA 3A2793
               01910 OUTPUT
                                       A, (PTYPE)
                              LD
92FD B7
               01920
                               OR
92FE 2816
               01930
                               JR
                                       Z, PARALL
                                       A, (OEAR)
9300 DBEA
               01940
                               IN
                                                         ;Transmitter holding register
9302 CB77
               01950
                               BIT
                                       6,A
9304 CDEF92
               01960
                              CALL
                                       BREAK
9307 28F1
               01970
                              JR
                                       Z,OUTPUT
               01980; The next four instructions provide a handshake with the printer.
               01990
                        If you do not have handshake capability,
                                                                    raplace them with
                     ; nine NOP's.
               02000
                                      You may want to look at a different stetus bit;
               02010; consult the manual if so.
               02020 AR2
9309 DBE8
                              IN
                                       A, (0E8B)
                                                         ;Printer ready?
930B CB77
               02030
                               BIT
                                       6, A
930D CDEP92
               02040
                               CALL
                                       BREAK
9310 20F7
               02050
                               JR
                                       NZ, AR2
9312 79
               02060
                               LD
                                       A,C
                                        (OEBH),A
9313 D3EB
               02070
                               OUT
9315 C9
               02080
                               RET
               02090 PARALL
9316 3AE837
                               LD
                                       A, (37E6R)
9319 E6F0
               02100
                                       OFOH
                               AND
931B PE30
               02110
                               CP
                                       30B
931D CDEF92
               02120
                               CALL
                                       BREAK
9320 20F4
               02130
                               JR
                                       NZ, PARALL
9322 79
               02140
                               LD
9323 32E837
               02150
                               LD
                                        (37E8R),A
9326 C9
               02160
                              RET
               02170 ; Replace the next value by zero if you do not have a serial
               02180
                      ; printer or if you want to power up in parallel printer mode.
9327 01
               02190 PTYPE
                              DEFB
                                       01
               02200 INIT
9328 00
                               DEF8
9329 00
               02210 LINE1
                               DEPB
                                       0
932A 42
               02220 PAGE
                               DEFR
                                       66
932B 42
               02230 TOTAL
                               DEPB
                                       66
932C 00
               02240 PAUSE
                               DEFB
                                       CONT3+0F7H
932D
               02250 CONT4
                               EQU
                                                                                            Program continues
```

```
02260 ;
               02270 ;
               02280 ; INSTRUCTIONS(C): It is possible to use both cassattes with
               02290 ; EDTASH. When the assemblar powers up, the first cassette
               02300 ; will be selected. Iesua POKE 37E4,01 to select the second
               02310 ; cassetta and PORE 37E4,00 to resalect the first.
                                                                               There will be
               02320 ; an audible click from the cassatte select relay when the assembler 02330 ; powers up. If you seldom use the cassettes and the click
               02340; annoys you, poke 00 into locations 73BA, 73BB, and 73BC now. 02350; It will still be possible to use the cassettas, but you
               02360 ; must then POKE 37E4 with the eppropriate value before doing so.
               02370
               02380 ;
               02390 ; INSTRUCTIONS(D): The assemblar can assemble directly into
               02400 ; any memory location between A000H and BFFFH. If you have 48X 02410 ; of memory, the last 16K have been protected from EOTASN. But
               02420 ; if you went to assemble directly into this area too (and so
               02430 ; anywhere from A000H to FFFFH), then POKE 8AB9, FF now.
               02440
               02450 ;
               02460 ; INSTRUCTIONS(E): Finally, POKE 75E1,32 now to convert the
               02470 ; stertup massage from "Version 1.1" to "Version 2.1" (respectively
               02480 ; "Vsrsian 1.2" to "Versian 2.2").
               02490 ;
                              Assemble the above text to memory. If you ere going to
               02500; add the TYPE command, issue
               02510 ; DUMP EDTASN6/CHD (START=X'7000', END=X'932D', TRA=X'8A00').
                              If you are going to stop here, POKE 8AB1,00 and POKE 8AB2,00
               02520 ;
               02530 ; to protect the assemblar from assembling code on top of itself.
               02540 ; Then POKE 7397,7F to enlarge the text buffer, and POKE 8E4D,23
                       to modify SIZE accordingly. Issue the command Ml if you want
               02550 ;
               02560 ; EDTASH to power up in keyboard entry mode one (and NO or H2
               02570 ; for other entry modes). Finally, if you added the lower case
               02580 ; modification, put the assembler in the mode in which you wish
               02590 ;
                        it to power up.
                                          Issue the command
               02600 ; DUNF EDTASN6/CMD (START-X'7000', END-X'932D', TRA=X'8A00').
               02610
00000 TOTAL ERRORS
```

```
Program Listing 7. EDTASM 7
                00100 ; INSTRUCTIONS: Run EDTASN6. If you stopped after the last 00110 ; modifications and leter decided to add the TYPE command, issue
                00120; the commands POKE BAB1,18 and POKE 8AB2,B0 to allow assembly 00130; anywhere in memory, issue POKE 4114,6F and POKE 7392,6F to
                 00140 ; restrict the sixe of the adit buffer, and issue POKE 8E4D,13
                 00150 ; to modify SIZE accordingly.
                                 Enter the code below and assemble it to memory.
                 00160 ;
                 00170 ; DUMP EDTASH7/CMD (START=X'7000', END=X'9501', TRA=X'8A00').
                 00180 ;
                                On not use the TYPE command of EDTASN7; it will crash the
                 00190 ; system.
                 00200; Since printers differ, you may have to change a few 00210; instructions below. These instructions are preceded by
                 00220; comment lines; read all such lines carefully.
                 00230 ;
                 00240 ;
                 00250 ; CODE TO DETECT TYPE COMMAND
                 00260
                 00270
                 00280 CONT4
                                            932DH
932D
                                  EOU
                                  EQU
                                            8BAFH
8BAF
                 00290 RETN
                                            RUSAH
8D8A
                 00300 LETTER
                                  EQU
                 00310 ERR4
                                  EQU
                                            SDSER
8D8E
                 00320 CONT
                                  EQU
                                            8B20H
BB20
                 00330 PRINT
9286
                                  EOU
                                            9286B
760C
                 00340
                                  ORG
                                            760CH
760C 2D93
                 00350
                                  DEFW
                                            CONT4
                 00360
                                  ORG
                                            CONT4
932D
                                  POSB
                                            RL
932D E5
                 00370
932E D5
                 00380
                                  PUSB
                                            OE
                 00390
                                  PUSB
                                            BC
932F C5
9330 F5
                 00400
                                  PUSB
                                            AF
9331 CDBB49
                                  CALL
                                             49BBR
                                                                ; Next letter
                 00410
                                             ' 7'
9334 FE59
                 00420
                                  CP
                 00430
                                  JR
                                            2, TYPE1
9336 280A
9338 CDAF8B
                 00440
                                  CALL
                                            RETN
                                                                ;Replace letter
                 00450
                                  POP
                                            AF
933B F1
933C C1
                 00460
                                  POP
                                            BC
9330 01
                                                                                                        Program continues
                                  POP
                                            DE
                 00470
```

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933E El	00480	PDP	HL		
933F C31C4C	00490	JP	4C1CH	Regular type command	
9342 CD8A8D	00500 TYPE1	CALL	LETTER	;Next letter	
9345 FE50	00510	CP	'P'		
9347 C28E8D	00520	JP	NZ, ERR4		
934A CD8A8D	00530	CALL	LETTER		
934D FE45	00540	CP	' E '		
934F C28E8D	00550	JP	NZ, ERR4		
9352 218F93	00560	LD	HL, TYPEA	;Initialize type command	
9355 362E	00570	LD	(HL),','		
9357 23	00580	INC	НL		
9358 3620	00590	LD	(HL),'		
935A 23	00600	1NC	HL		
935B 3620	00610	LD	(HL),''		
935D 23	00620	INC	HL		
935E 3600	00630	LD	(HL),0		
9360 23	00640	INC	HL		
9361 3600	00650	LD	(HL),0		
9363 219A93	00660	LD	HL, BUFF		
9366 229493	00670	LD	(TYPEA+5),HL		
9369 3E00	00680	LD	A, 0		
936B 329693	00690	LD	(TYPEA+7),A		
936E 211A94	00700	LD	HL, BUFFT		
9371 229793	00710	LD	(TYPEA+8),HL		
9374 213947	00720	LD	HL,4739H	;Intercept text output	
9377 36C3	00730	LD	(HL),0C3H		
9379 21BC94	00740	LD	HL, CHANGE	;Intercept printer output	
937C 22AB45	00750	LD	(45ABH), HL	•	
937F 21AE94	00760	LD	HL, NOTAB		
9382 223A47	00770	LD	(473AH), HL		
9385 F1	00780	POP	AF		
9386 Cl	00790	POP	BC		
9387 D1	00800	POP	DE		
9388 E1	00810	POP	HL		
9389 CD1C4C	00820	CALL	4C1CH		
938C C36C95	00830	JР	STUFF		
938F 2E	00840 TYPEA	DEFB	'.' :Last t	three characters inserted	Program continues
·	_		•===		

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```
9390 20
               00850
                              DEFB
                                                        ;into buffer
9391 20
               00860
                              DEFB
9392 00
               00870
                              DEFB
                                      0
                                                        ;One if title being entered
9393 00
               00880
                              DEFB
                                      0
                                                        ; Number of letters in buffer
                                      BUFF
9394 9A93
               00890
                              DEFW
                                                        ;Next buffer spot
9396 00
               00900
                              DEFB
                                                        ; Number of letters in title buffer
9397 1A94
               00910
                              DEFW
                                      BUFFT
                                                        ;Next title buffer spot
               00920 ; The next address contains the number of characters on a
                     ; printed line. This number should be 31 for the Radio Shack
               00930
               00940
                     ; Quick Printer II and about 60 for a regular printer. It can
               00950 ; be as large as 127.
9399 3C
               00960 BUFFL
                              DEFB
                                      60
939A
               00970 BUFF
                              EQU
941A
               00980 BUFFT
                              EQU
                                      BUFF+80H
949A
               00990 INIT2
                              EQU
                                      BUFF+100H
               01000
               01010 ;
               01020 ; ADDITIONAL INITIALIZATION BEFORE EDTASM PROMPT
               01030
               01040 ;
8B43
               01050
                                      CONT+23H
                              ORG
8B43 9A94
               01060
                              DEFW
                                       INIT2
949A
               01070
                              ORG
                                       INIT2
                                      HL,4739H
949A 213947
               01080
                              LO
949D 36F5
               01090
                              LD
                                       (HL), OF5H
949F 23
               01100
                              INC
                                      HI
94A0 36E5
               01110
                              LO
                                       (HL),0E5H
94A2 23
               01120
                              INC
                                      HL
94A3 3621
                                       (HL),21H
               01130
                              LD
94A5 218692
               01140
                              LD
                                      HL, PRINT
                                       (45ABH),HL
94A8 22AB45
               01150
                              LD
94AB C3DD46
                                       46DDH
               01160
                              JP.
               01170
               01180
               01190 ;
                       CONVERT TAB TO ONE
               01200
               01210 ;
                                                                                         Program continues
```



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A bus adapter for the TRS-80 Model One (40-pin bus).

. . . . MODEMS

	94AE	FE09	01220	NOTAB	CP	9	;Tab
	94B0		01230		JR	NZ,JJ	
	94B2	3E01	01240		LD	A, 1	
	94B4	F5	01250	JJ	PUSH	AF	;Instructions replaced by JP
	94B5	E5	01260		PUSH	HL	
	94B6	21BA41	01270		LD	HL,41BAH	
	94B9	C33E47	01280		JP	473EH	İ
			01290				
			01300	;			
			01310	; INTER	CEPT 'T'	OUTPUT, MODIFY,	AND SEND TO PRINTER
			01320				
			01330				
	94BC	-		CHANGE	LD	A,C	
	_	FE0D	01350		CP	13	;Ignore line feeds
	94BF		01360		RET	Z	
	94C0		01370		CP	1#1	;Start of stop title
		CAD195	01380		JP	Z, TITLE	
		3A9293	01390		LD	A, (TYPEA+3)	;Character in title?
	94C8		01400		OR	A	
		C2D195	01410		JP	NZ, TITLE	
	94CC		01420		LD	A, C	
		FE01	01430		CP	1	;Tab
	94CF	CA9295	01440		JP	Z, PARA	
			01450				
			01460				
			01470 ; CAPITOLIZATIO			N ROUTINE	
			01480				
			01490 ;				NOR NOR NOR if you did not
			01500; Replace the next command 01510; add the lower case modi				
	0.453	C2D40E	01510	; and t	JP	EASY	;No capitolization
		C3D495					;Start of sentence?
		3A9193	01530		LD CP	A, (TYPEA+2)	iprair of semember
		FE20	01540		JR		
		204D 3A9093	01550 01560			NZ,ONWARD A,(TYPEA+1)	
		3A9U93 FE20	01570		LD CP	A, (TIPERTI)	
		2046	01570		JR	NZ, ONWARD	
		2046 3ABF93	01580		LD	A, (TYPEA)	
	94 E 3	JADE 33	01330		טנו	U. / ITERUI	
_							

SERIAL PRINTER? HEATH H14?

Interface mounts in TRS-80 Espansion Interface. NO MODIFICATIONS. Connects at persited printer port, No EI? Use with RS printer interface cable. Uses the software driver in the Level 2 RON. No more software competability problems. Works with Elec Pen, Scrips, Fortran, Newdos, Ytos, etc. The computer thinks it is driving an RS parallel printer. Hendahaking for reliable full speed operation. reliable full apaed operation.

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-			
94E6 FE2E	01600	CF '.'	
94E8 2804	01610	JR Z,YES	
94EA FE3F	01620	CP 131	
94EC 203B	01630	JR NZ,ONWARD	
94EE CD1E95	01640 YES	CALL CAP	
94F1 1803	01650	JR REG1	
94F3 CD1295	01660 REGULA	CALL REVERS	;Routine for regular letter
94P6 CD0595	01670 REG1	CALL MOVE	•
94F9 79	01680	LD A,C	
94FA FE49	01690	CP 'I'	
94FC 2001	01700	JR NZ,XX	
94FE 3C	01710	INC A	
94FF 329193	01720 XX	LD (TYPEA+2),A	
9502 C3D495	01730	JP EASY	
9505 3A9093	01740 MOVE	LD A, (TYPEA+1)	
9508 328F93	01750	LD (TYPEA),A	
950B 3A9193	01760	LD A, (TYPEA+2)	
950E 329093	01770	LD (TYPEA+1),A	
9511 C9	01780	PET	
9512 79	01790 REVERS	LD A,C	;Correct keyboard
9513 FE41	01800	CP 41H	
9515 D8	01810	RET C	
9516 FE5B	01820	CP 5BH	
9518 3004	01830	JR NC, CAP	
951A C620	01840	ADD A,20H	
951C 4F	01850	LD C,A	
951D C9	01860	RET	
951E 79	01870 CAP	LD A,C	
951F FE61	01880	CP 61H	;Capitolize
9521 D8	01890	RET C	
9522 FE7B	01900	CP 7BH	
9524 DO	01910	RET NC	
9525 D620	01920	SUB 20H	
9527 4F	01930	LD C,A	
9528 C9	01940	RET	
9529 3A9193	01950 ONWARD	LD A, (TYPEA+2)	
952C FE49	01960	CP 'I'	
			Program continues



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```
952E 2B07
               01970
                                         Z, EIP
                                                           ;Previous letter 'i'
9530 79
               01980
                               LD
                                        A,C
9531 FE49
               01990
                               CP
9533 2819
               02000
                               JR
                                        Z,EI
                                                           ;Current letter 'i'
9535 18BC
               02010
                               JR
                                        REGULA
9537 79
               02020 EIP
                               LD
                                        A,C
9538 FE20
               02030
                               CP
953A 2009
               02040
                               JR
                                        NZ, GG
953C C5
               02050
                               PUSH
                                        ВC
                                        C, 'I'
953D 0E49
               02060
                               LD
953F CDD495
               02070
                               CALL
                                         EASY
9542 Cl
               02080
                               POP
                                        BC
9543 1BAE
               02090
                               JR
                                        REGULA
9545 C5
               02100 GG
                               PUSH
                                        ВC
9546 0E69
               02110
                               LD
                                         C, 'I'+20H
9548 CDD495
               02120
                               CALL
                                         EASY
954B C1
               02130
                               POP
                                        BC
954C 18A5
               02140
                               JR
                                        REGULA
954E 3A9193
                02150 EI
                               LD
                                        A, (TYPEA+2)
9551 FE20
               02160
                               CP
9553 209E
9555 3E49
                               JЯ
                                        NZ, REGULA
A, II
               02170
               02180
                               LD
9557 329193
                02190
                                         (TYPEA+2),A
                               LD
955A C9
               02200
                               RET
               02210
                02220
                      ; LINEFEED ROUTINE
                02230
               02240 ;
                02250
955B CD6695
                02260 LINEFD CALL
                                        LINEF1
955E 3A6595
               02270
                               LD
                                        A, (DOUBLE)
9561 B7
                02280
                               OR
                                        Α
9562 C8
               02290
                               RET
                                        Z
9563 1801
                02300
                                        LINEF1
                               JЯ
               02310 ; Insert zero in the next address for single space and one for 02320 ; double space.
9565 00
               02330 DOUBLE DEFB
9566 0E0D
                02340 LINEF1
                               LD
                                         C,13
                                                           ;Print line feed
9568 CD8692
               02350
                               CALL
                                         PRINT
956B C9
                02360
                               RET
                02370
               023B0
                02390 ; ROUTINE TO PRINT HALF-FILLED BUFFER
                02400
                02410
956C 3A9393
                02420 STUFF
                               LD
                                        A, (TYPEA+4)
956F B7
               02430
                               OR
9570 C8
                02440
                               RET
9571 E5
               02450
                               PUSH
                                         HL
9572 C5
               02460
                               PUSH
                                         BC
9573 CDBD95
               02470
                               CALL
                                         MAR1
9576 47
                02480
                               LD
                                         B,A
9577 219A93
                                        HL, BUFF
               02490
                               LD
                                         C, (HL)
957A 4E
                02500 YA
                               LD
957B CDB692
                02510
                               CALL
                                         PRINT
957E 23
                02520
                               INC
                                         HL
957F 10F9
9581 3E00
               02530
                               DJINZ
                                         YA
               02540
                               LD
                                         A,0
95B3 329393
               02550
                               LD
                                         (TYPEA+4),A
9586 219A93
               02560
                               LD
                                        HL, BUFF
9589 229493
               02570
                                         (TYPEA+5), HL
                               LD
95BC CD5B95
               02580
                               CALL
                                         LINEFD
958F C1
                02590
                               PDP
                                         вc
9590 El
                02600
                               PDP
                                         HI.
9591 C9
                02610
                               RET
                02620
                02630 ;
                02640 ; PARAGRAPH ROUTINE
                02650
                02660
9592 CD6C95
               02670 PARA
                               CALL
                                         STUFF
9595 3ABB95
               02680
                               LD
                                         A, (EXTRA)
9598 B7
                02690
                               OR
9599 2805
               02700
                               JR
                                         Z, NOEX
959B 0E0D
               02710
                               LD
                                         C,13
959D CD8692
               02720
                               CALL
                                         PRINT
95A0 E5
               02730 NOEX
                               PUSH
                                         HL
95A1 C5
               02740
                               PUSH
                                         BC
95A2 3ABC95
               02750
                               LD
                                         A, (PARAL)
95A5 47
               02760
                               LD
                                         B,A
95A6 219A93
                02770
                               LD
                                         HL, BUFF
95A9 0E20
                02780
                               LD
                                         (HL),C
95AB 71
                02790 RA
                               LD
                                                                                            Program continues
```

```
95AC 23
               02800
                              INC
                                       HL
95AD 10FC
               02810
                              DJNZ
                                       RA
                                       (TYPEA+5),HL
95AF 229493
               02820
                              LD
95B2 3ABC95
               02830
                              LD
                                       A, (PARAL)
95B5 329393
               02840
                              LD
                                       (TYPEA+4),A
               02850
                              POP
95B8 C1
                                       BC
95B9 E1
               02860
                              POP
                                       HL
95BA C9
               02870
                              RET
               02880 ; Insert zero in the next address for no extra lines between
                                    and one for one extra line.
               02890
                       paragraphs,
95BB 00
               02900 EXTRA
                              DEFB
                                       0
                       Insert below the number of spaces in a paragraph indentation.
               02910
95BC 05
               02920 PARAL
                              DEFB
               02930
               02940
               02950
                     : MARGIN ROUTINE
               02960
               02970
95BD F5
               02980 MAR1
                              PUSH
95BE C5
               02990
                              PUSH
                                       ВC
95BF 3AD095
                                       A, (MARGIN)
               03000
                              LD
95C2 B7
               03010
                              OR
95C3 2808
               03020
                              JR
                                       Z,KLK
95C5 47
               03030
                              LD
                                       B,A
                                       С,20Н
95C6 0E20
               03040
                              LD
95C8 CD8692
               03050 XJ
                              CALL
                                       PRINT
95CB 10FB
               03060
                              DJNZ
                                       ХJ
95CD C1
               03070 KLK
                              POP
                                       BC
               03080
95CE F1
                              POP
                                       AF
95CF C9
               03090
                              RET
               03100 ; Load the next address with the number of spaces in the left
               03110 ; margin.
                                 This should be zero for the Quick Printer II and
                       about 12 for a regular printer.
               03120
95D0 0C
               03130 MARGIN
                              DEFB
                                       12
95D1
               03140 TITLE
                              EQU
95D4
               03150 EASY
                              EQU
                                       TITLE+3
0000
               03160
                              END
00000 TOTAL ERRORS
```

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style, etc. However, comments which begin in the comment column can be ignored; they explain the operation of the code for those who are interested.

Memory Distribution

See Table 2 for en explanation of memory distribution. When EDTASM is entered, it occupies 7000-96E6. Immediately, 7000-89FF is moved to the original EDTASM location; some of this area then becomes part of the editor buffer. The

BASIC RAM area 4000-42FF is modified by EDTASM, but temporerily restored to original form by the J command.

A Final Touch

The modified EDTASM can be used to write and correct assembly language programs interactively, much as BASIC is used. There is one difference. When assembly language programs go wrong, they go horribly wrong. If your program has a mistake, the J command may

not return control to the assembler and you might have to push RESET to tame the computer.

In that case, there is a simple way to return to the editor/assembler with your program intact. After you hit RESET, the DOS prompt will appear. Execute SAVE and EDTASM and Y. You will find yourself back in the assembler with the editor buffer intact.

The program SAVE/CMD used above should be permanently placed on the EDTASM disk.

Create it by using DEBUG and entering the following machine code.

> 8000 F3 21 F9 5C 11 C0 9F 01 8008 07 23 ED B0 C3 20 40

Owners of version 1.2 should replace F9 on the top line with F0 and 07 on the bottom line with 10

Turn off DEBUG, and execute:

DUMP SAVE/CMO (START = X'8000',EN0 = '8010',TRA = X'8000')■

```
9327
       Zero for Parallel Printer, One for Serial Printer
       Current Line, Zero for Top of Form
9329
932A
       Lines per Page
932C
       Zero for Continuous Printing, One for Pause between Pages
9399
       Number of Printed Characters per Line
9565
       Zero for Single Space, One for Double Space
9588
       Zero for No Additional Spaces between Paragraphs, One for Addi-
       tional Spaces
95BC
       Length of Paragraph Indentations
95D0
       Length of Left Margin
96ES
       Zero for Single Width Letters in Titles, One for Double Width Letters
```

Table 1.

```
0000-3FFF
            Basic ROM, Keyboard, Etc.
            Basic Fixed RAM, Used Independently by EOTASM
4000-42FF
4300-5CF8
            EOTASM (Original Program)
                        5C = #
5CF9-7FFF
            Text Ouffer
8000-89FF
            Used Only When Loading EOTASM
8A00-96E6
            EOTASM (New Program)
96E7-98FF
            Available for Future Expansion
            Stack While Using J
9900-99EF
99F0-9FFF
            Used by J. X. Y
A000-BFFF
            Reserved for Machine Language Programs, Used by X, Y
C000-FFFF
            Unused
```

Table 2. Memory Distribution

```
Program Listing 8. EDTASM 8
               00100 ; INSTRUCTIONS:
                                         Run EDTASM7.
                                                        Enter the following text and
                                                  Then read the instructions at the
               00110
                      ; assemble it to memory.
               00120; end of this section.
               00130
               00140
                     ; PRINT ROUTINE
               00150
               00160
               00170
95D1
               00180 TITLE
                               EQU
                                        95D1H
95D4
               00190 EASY
                               EQU
                                        95D4H
955B
               00200 LINEFD
                                        955BH
                               EOU
9399
               00210 BUFFL
                               EQU
                                        9399H
956C
               00220 STUFF
                               EQU
                                        956CH
9286
               00230 PR1NT
                               EQU
                                        9286H
938F
               00240 TYPEA
                               EQU
                                        938FH
939A
               00250 BUFF
                               EQU
                                        939AH
941A
               00260 BUFFT
                               EQU
                                        941 AH
95BD
               00270 MAR1
                               EOU
                                        95 BDH
95D1
               00280
                               DRG
                                        TITLE
95D1 C33F96
               00290
                               JP
                                        TITLE
95D4
               00300
                               ORG
                                        EASY
95D4 79
               00310
                               L.D
                                        A,C
                                                          ;Don't print initial space
95D5 FE20
               00320
                               CP
95D7 2005
               00330
                               JR
                                        Nz, XA
95D9
     3A9393
               00340
                               LD
                                        A, (TYPEA+4)
95DC B7
               00350
                               OR
95DD C8
               00360
                               RET
95DE E5
               00370 XA
                               PUSH
                                        HL
95DF D5
               00380
                               PUSH
                                        DE
95E0 C5
               00390
                               PUSH
                                        BC
95E1 79
               00400
                               LD
                                                          ;Insert character into buffer
               00410
95E2 2A9493
                                        HL, (TYPEA+5)
                               LD
95E5
     77
               00420
                                        (RL),A
                               LD
95E6 23
                               INC
               00430
                                        HI.
95E7 229493
               00440
                                        (TYPEA+5), HL
                               LD
95EA 3A9393
               00450
                               LD
                                        A, (TYPEA+4)
95 ED 3C
               00460
                               INC
95EE 329393
               00470
                               LD
                                        (TYPEA+4),A
95F1 219993
               00480
                               LD
                                        HL, BUFFL
95F4 BE
               00490
                               CP
                                        (HL)
                                                          : Te buffer full?
                                                                                   Program continues
```

```
95F5 2804
                00500
                                         Z,XB
                                JR
95F7 Cl
                00510 STOP
                                POP
                                         ВC
95F8 D1
                00520
                                POP
                                         DE
95F9 El
                00530
                                POP
                                         HL
95FA C9
                00540
                                RET
95FB CDBD95
                00550 XB
                                CALL
                                         MAR1
95FE 46
                00560
                                LD
                                         B, (HL)
                                                           ;Find last space in buffer
                                         HL, (TYPEA+5)
95FF 2A9493
                00570
                                LD
9602 2B
                00580 XC
                                DEC
                                         HI.
                                         A, (HL)
9603 7E
                00590
                                LD
9604 FE20
                00600
                                СP
9606 2806
                00610
                                JR
                                         Z,XD
9608 10F8
                00620
                                DJNZ
                                         ХC
960A 219993
                00630
                                LD
                                         HL, BUFFL
960D 46
                00640
                                LD.
                                         B, (HL)
                                                           ; If no spaces, print entire line
960E C5
                00650 XD
                                PUSH
                                         BC
960F 219A93
                00660
                                         HL, BUFF
                                LD
                                                            ;Print buffer
9612 4E
                00670 XD1
                                LD
                                         C, (HL)
9613 CD8692
                00680
                                CALL
                                         PRINT
9616 23
                00690
                                INC
                                         RT.
9617 10F9
                00700
                                DJNZ
                                         XD1
                00710
9619 Cl
                                POP
                                         ВC
961A 3A9993
                                         A, (BUFFL)
                00720
                                LD
961D 90
                00730
                                SUB
                                         R
                                                            ;Remaining buffer length
961E B7
                00740
                                OR
                                         (TYPEA+4),A
961F 329393
                00750
                                LD
9622 2810
                00760
                                JR
                                         Z,XE
                                                            ;Remaining buffer empty
9624 47
                00770
                                LD
                                         B,A
                                                            ;Move old buffer to new
9625 119A93
                00780
                                LD
                                         DE, BUFF
9628 7E
                00790 XF
                                LD
                                         A, (EL)
9629 12
                00800
                                LD
                                         (DE),A
                00810
962A 23
                                INC
                                         HL
962B 13
                00820
                                         DE
                                INC
962C 10FA
                00830
                                DJNZ
                                         XF
962E ED539493 00840
                                T.D
                                         (TYPEA+5), DE
9632 1806
                00850
                                JR
                                         XG
9634 219A93
                00860 XE
                                LD
                                         HL, BUFF
9637 229493
                00870
                                LD
                                         (TYPEA+5), HL
963A CD5B95
                00880 XG
                                CALL
                                         LINEFD
963D 18B8
                00890
                                JR
                                         STOP
                00900
                00910
                00920 ; TITLE ROUTINE
                00930
                00940
963F 3A9293
                00950 TITLE1
                               LD
                                         A, (TYPEA+3)
                                                           :Start of title?
9642 FE00
                00960
                                CP
                                         NZ,AA
9644 2013
                00970
                                JR
9646 E5
                00980
                                PUSH
                                         HL
9647 3E01
                00990
                                I.D
                                         A, 1
9649 329293
964C 3E00
                01000
                                LD
                                         (TYPEA+3),A
                                                            ;Title mode
                01010
                                LD
                                         A,0
964E 329693
                01020
                                         (TYPEA+7),A
                                LD
                                                            ;Title empty
9651 211A94
                01030
                                LD
                                         HL, BUFFT
9654 229793
                01040
                                LD
                                         (TYPEA+8),HL
                                                           ;Start of title
9657 El
                01050
                                POP
9658 C9
                01060
                                RET
9659 79
                01070 AA
                                LD
                                         A,C
                                                            ;End of title?
965A FE23
                01080
                                CP
965C 282C
                01090
                                JR
                                         Z,AB
965E E5
                01100
                                PUSH
                                         HL
965F 3A9693
                01110
                                LD
                                         A, (TYPEA+7)
                                                           ; If not, add letter to title
9662 47
                01120
                                LD
                                         B, A
9663 3AE596
                                         A,(DW)
                01130
                                LD
9666 B7
                01140
                                OR
9667 281B
                01150
                                JR
                                         Z,AP
9669 219993
                01160
                                LD
                                         HL, BUFFL
966C 7E
966D CB3F
                01170
                                         A, (HL)
                                LD
                01180
                                SRL
966F B8
                01190 AQ
                                CР
9670 2810
                01200
                                JR
                                         Z,HH
                                                            ;unless title full
9672 2A9793
                01210
                                LD
                                         HL, (TYPEA+8)
9675 79
                01220
                                LD
9676
     77
                01230
                                LD
                                         (HL),A
9677 23
                01240
                                INC
                                         HL
9678 229793
                01250
                                LD
                                         (TYPEA+8), HL
967B 3A9693
                01260
                                LD
                                         A, (TYPEA+7)
967E 3C
                01270
                                INC
967F 329693
                                         (TYPEA+7),A
                01280
                                LD
9682 El
                01290 HH
                                POP
                                         HL
9683 C9
                01300
                                RET
9684 219993
9687 7E
                01310 AP
                                I.D
                                         HL, BUFFL
                01320
                                LD
                                         A, (HL)
                                                                                             Program continues
```

```
9688 18E5
                01330
                                JR
                                         A<sub>0</sub>
968A AF
                01340 AB
                               XOR
                                                           ;Leave title mode
968B 329293
                01350
                                LD
                                         (TYPEA+3), A
968E CD6C95
                01360
                                CALL
                                         STUFF
                                                           :Print all before title
9691 3A9693
                01370
                                LD
                                         A, (TYPEA+7)
9694 B7
                01380
                                OR
                                                           ;Title empty?
9695 2004
                01390
                                JR
                                         NZ,AC
9697 CD5B95
                                CALL
                01400
                                         LINEFD
                                                           ; If so, print empty line
969A C9
                01410
                                RET
969B F5
                01420 AC
                                PUSH
969C CDBD95
                01430
                                CALL
                                         MARI
969F 3AE596
                01440
                                         A, (DW)
                                LD
96 A2 B7
                01450
                                OR
96A3 2805
                01460
                                JR
                                         Z,AD
                01470 ; If you can print double width characters, load C below with
                01480 ; the control character which begins double width printing.
                01490 ;
                        This control character is OFH for the Radio Shack Quick
                01500 ; Printer II.
96A5 0E0F
                01510
                                LD
                                         C,OFH
96A7 CD8692
                01520
                                CALL
                                         PRINT
96 AA F1
                01530 AD
                                POP
                                         AF
96 AB 47
                01540
                                LD
                                         B, A
96AC 3A9993
                01550
                                         A, (BUFFL)
                                LD
96 AF 4F
                01560
                                LD
                                         C,A
96 BO 3AE5 96
                01570
                                LD
                                         A, (DW)
96 B3 B7
                01580
                                OR
96B4 2805
96B6 79
                01590
                                JR
                                         Z,AM
                01600
                                LD
                                         A,C
96B7 CB3F
                01610
                                SRL
96B9 1801
                01620
                                JR
                                         AN
96BB 79
                01630 AM
                                         A,C
                                LD
96BC 90
                01640 AN
                                SHR
                                         В
                                                           ;Spaces at two ends of title
96 BD CB3F
                01650
                                SRL
                                         Α
                                                           ;Divide by two
96BF 47
                01660
                                LD
                                         B, A
96C0 B7
                01670
                                OR
                                         Α
96Cl 2807
                01680
                                JR.
                                         Z, AE
                                                           ; No spaces at left
                                         C, '
96C3 0E20
                01690
                                LD
96C5 CD8692
                01700 AJ
                                CALL
                                         PRINT
96C8 10FB
                01710
                                DJ NZ
                                         A.T
96CA 3A9693
                01720 AE
                                LD
                                         A, (TYPEA+7)
                                                           ;Title length
                                         B,A
96CD 47
                01730
                                LD
96CE E5
                01740
                                PUSH
                                         HL
                01750
                                         HL, BUFFT
96CF 211A94
                                LD
96D2 4E
                01760 AG
                                LD
                                         C, (HL)
                                                           ;Print title
                01770
                                         PRINT
96D3 CD8692
                                CALL
96D6 23
96D7 10F9
                01780
                                INC
                                         HL.
                01790
                                DJNZ
                                         AG
96D9 El
                01B00
                                POP
                                         HL.
96 DA CD5B95
                01810
                                CALL
                                         LINEFD
                01820 ; Replace the next line with NOP, NOP if your printer is not
                01830 ; automatically converted from double width to single width
                OlB40 ; mode by a line feed. Notice that the line should remain as
                01850 ; is for the Radio Shack Quick Printer II.
96DD 1805
                                JR
                                         AH
                01860
                01870 ; Load C below with the control character needed to convert
                01880 ; your printer back to single width style.
96DF 0E00
                01890
                                LD
                                         C,00
96E1 CD8692
                01900
                                CALL
                                         PRINT
96E4 C9
                01910 AH
                                RET
                01920 ; Insert a zero in the address below for single width title
                01930 ; characters and a one for double width title characters.
96E5 00
                01940 DW
                                DEFB
                                         n
96 E6
                01950 CONT5
                                EQU
                                         S
                01960 ;
                01970 ;
                019BO; INSTRUCTIONS: Now a few cleanup details before saving the
                01990 ; final version of EDTASM.
                                                      Make sure locations INIT, LINE, PAGE,
                02000; TOTAL, and PAUSE contain the right values (they will unless 02010; you used the printer after running EDTASM7 or you want different
                02020; initial values than those I provided).
                                                                      Next POKE 8AB1,00
                02030; and POKE 8AB2,00 to protect the assembler from assembling
                                                    Then POKE 7397,7F to enlarge the
                02040 ; code on top of itself.
                02050 ; text buffer and POKE 8E4D,23 to modify SIZE accordingly.
                02060 ; Make sure locations BUFFL, DOUBLE, EXTRA, PARAL, MARGIN,
                02070 ; and DW contain the values you want on initialization. Issue
                02080 ; the command M1 if you want EDTASM to power up in keyboard
                02090
                      ; entry mode one (and MO or M2 for other entry modes). Finally,
                02100; if you added the lower case modification, put the assembler 02110; in the mode in which you wish it to power up. Issue the co. 02120; DUMP EDTASMB/CMD (START=X'7000',END=X'96E6',TRA=X'8A00').
                                                                               Issue the command
0000
                02130
                                END
00000 TOTAL ERRORS
```

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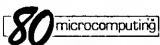
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he February 1980 issue of 80 Microcomputing carried an article by Wes Thielke on "ROM Routines." The section on keyboard encoding interested me. I entered the program and ran it.

After looking at the output, I thought I could use it to create a little drawing program. I came up with the following program.

Compu-sketch

When an arrow key is de-

pressed, the pixel will move in the indicated direction, if two keys are pressed at the same time, the pixel will move in the diagonal direction determined by the keys.

Interesting, but I thought I should be able to blank the trail so I could interrupt the lines. After some playing around, I set it up so that if the space bar is held down while the arrow key is depressed, the pixel will not leave a trail.

Lastly, I could not clear the screen unless I used the break key, and then ran the program again. With a couple of added lines I cleared the screen by pressing the clear key and space bar at the same time.

Graphic Set-upa

This little program could certainly speed up game graphic set-ups.

A very short PEEK-POKE rou-

tine could transfer the graphics from the screen to memory and another PEEK-POKE routine could recall them. Take a look at the program.

```
100 CLS:X = 56 Y = 22.DEFINT C
```

Program Listing 1. Etch-a-compu-sketch.

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¹¹⁰ C = PEEK(14400)

²²⁰ RESET (X,Y) FOR T # 1TO1.NEXT.SET (X Y) GOTO110

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RESTORE Data Pointer Control

10 ON ERROR GOTO 200
20 D = 0: EL = 0
30 READ A\$: 0 = 0 + 1
40 PRINT A\$:
50 IF A\$ = "MOUSE" THEN EL = D ELSE 30
55 REM "MOUSE" IS THE LAST OF THE STRING DATA
60 READ A. PRINT A,
70 GOTO 60
100 DATA CAT, DOG, MOUSE
110 DATA 9, 18, -21, 3.98
200 RESTORE
210 FOR I = 1 TO EL
220 REAC A\$: NEXT I

Program Listing 1

230 RESUME 50

10 ON ERROR GOTO 200
20 Q = 0: EL = 0: REM 0 FOR DELETE, EL FOR LAST ELIMINATED
30 READ A: O = D + 1
40 IF A = 9.9 THEN EL = D: REM 9.9 IS LAST DATA ELIMINATED
50 PRINT A,
60 GOTO 30
100 DATA 6, 9, -8, 9.9, 4, 8
110 DATA 7, 3.45, 2.1
200 RESTORE : REM ALL DATA IS RESTOREO
210 FOR I = 1 TO EL : REM THE FIRST EL DATA ARE READ
220 READ A: NEXT I : REM OUT NOT PRINTED
230 RESUME

Program Listing 2

: REM SEE TEXT FOR M, N, P, R VALUES 65000 INPUT M. N. P. R. 65010 RR = N + (R - 1) * (N - P - M) : REM RR = TOTAL DATA WANTED 65020 DIM A(RR) : REM. THIS SIZE ARRAY ALLOWS R REPEATS : REM. THE FIRST NIDATA ITEMS ARE 65030 FOR I = 1 TO N READ : REMI AND PLACED IN THE FIRST N 65040 READ A(I) 65050 NEXT I : REM ENTRIES OF AN ARRAY A 65060 FOR I = 1 TO RR : REM. ALL OF ARRAY A IS FORMED 65070 IF I>M THEN A(I) = A(I - (N - M) · INT((I - M - 1)/(N - M))) 65080 REM. THIS INSURES THE FIRST MITTEMS ARE USED ONLY ONCE 65090 IF (>2.N - M - P THEN A(1) = A(1 + M + P - N) 65100 REM THIS ENABLES US TO USE THE LAST PITEMS ONLY ONCE 65110 NEXT I **65120 RETURN**

Program Listing 3

David R. Cecil Dept. of Mathematics Texas A & I University Kingsville, TX 78363

the OATA pointer to some other place than the start of the DATA list or only to certain data statements through the RESTORE command have been tha topic of many a letter to the editor in microcomputing journals of late.

The following programs illustrate two methods of obtaining a selected RESTORE. The method in Programs 1 and 2 RESTORES to the first of the data set and then reads to the desired data. The method in Program 3 places the data in an array and relabels the subscripts of the array, so that selected lines of data may be restored and used as often as desired.

When we run Program 1, the output will be 6.9 -8.9.9.4.8.7.3.45.2.1.4, etc. We have restored only the data appearing after the data value of 9.9.

Program Listing 2 allows us to restore only numeric data, if we have all the string data listed together and appearing before any numeric data.

It all the numeric data is listed before any string data, then we simply replace each A\$ by A and each A by A\$, as in Program 2. Line 50 would have A = fast numeric data value.

Using an Array

The second method, using an array for storing the data, allows us to use all the data once and then reuse any consecutive portion as often as we wish. To illustrate this method, we'll use a subroutine with high line numbers.

To use this Data Restore Computation method with any of your programs, type the subroutine in Program Listing 3 and, for the very first line of your existing program, put 0 GOSUB 65000.

The subroutine asks for four inputs M, N, P and R. These values are given by the following:

M = the number of data items at the beginning of the DATA statements that will be used only once;

N = the number of data items to be used until wa want to reuse some data;

P = tha number of data items, from item N - P + 1 to N, that will be used only once (the middle items from the $M + 1^{st}$ through the $N - P^{th}$ are the only items that will be reused);

R = repeats the total number of times the data items M + 1 through N - P will be used.

Table 1 illustrates how the subroutine forms array A. The





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Original Subscripts	Relabeled Subscripts	Comments
A(1)	A(1)	This data only used
: A(M)	: A(M)	at first and not repeated.
A(M + 1)	A(M + 1)	First use of that
:	:	part of the data to
A(N - P)	A(N - P)	be repeated
A(N - P + 1)	A(N - P + 1)	This data used only
:	:	once and not
A(N)	A(N)	repeated
A(N + 1)	A(M + 1)	
: A(2N - M - P)	: A(N – P)	R ~ 1 additional uses
		of data items M + 1
A(RR - N + P + M + 1)	A(M + 1)	thru N - P
A/DEN	: A(N – P)	
A(RR)	MIN - F)	
	Table 1	

short program in Listing 4 with four DATA statements should help you get used to our M, N, P, R input notation.

If we input 4, 10, 2, 4 when the prompt? appears, then data line 20 will be used only once (the 4 input); all the data will be used (10 items); data line 50 will be used only once (the 2 input); and data lines 30 and 40 will be used a total of four times (the 4 input). The output will then be (49-80)? 15 2 (3 6) (7 15 2) (7 15 2) (7 15 2). The parentheses are not output, but are used to show the grouping.

If we want to use data lines 20 and 30, with line 30 used six times, we would input 4, 7, 0, 6. (Note that line 30 is used once for the first listing of seven items and then line 30 is used five additional times.)

We see that 0, 10, 0, 3 would use all ten data items three times, while 4, 8, 1, 2 would use data lines 20, 30 and 40, and then repeat data line 30 one more time.

Try other combinations of values for inputs. Be sure you use whole number values for all four inputs with $M \ge 0$, N > 0, $P \ge 0$, R > 0 and N > M + P. Program Listing 4 has very little data, but remember that for larger N and R, the subroutine takes a longer time to form the array.

Program Listing 3 can be used equally well with string data. You need only change each A to A\$ in lines 65020, 65040, 65070 and 65090. You could try this with Program Listing 5.

Inputs of 3, 8, 2, 4 give an output of ABCDEFGHDEFDEF. If we change the first part of line 10 to FOR I = M + 1 to RR, then inputs of 2, 5, 0, 3 would result in line 30, and only line 30, being used three times.

I hope these methods will make your RESTORE problems seem like child's play.■

- 0 GOSU8 65000
- 10 FOR I = 1 TO RR; PRINT A(I);; NEXT I: STOP
- 20 DATA 4, 9, -8, 0
- 30 GATA 7, 1, 5
- 40 DATA 2
- 50 OATA 3.6

Program Listing 4

- 0 GOSUB 65000
- 10 FOR I = 1 TO RR: PRINT AS(I); : NEXT I . STOP
- 20 DATA A, 6
- 30 DATA C. O. E.
- 40 DATA F
- 50 OATA G. H. I. J

Program Listing 5

Less Is More

C. E. Winterbauer 3910 Bendini St. San Diego, CA 92103

0000

Sometimes a program is written and becomes a favorite for a silly reason.

This is partly the case with this routine. While it's useful, it's particularly attractive because the program does so much with so little code! It was written in assembly language but is so short that it's faster to load it directly using Debug. It also uses a relative jump, making its location unimportant. I placed it at 3000H only for convenience while using it alone.

It's an easy program.

ORG 3000H 3000 3000 2100F8 PRINTER LD HL, OF SOOH IMEM START LOCATION ; INITIAL NUM OF LINES 3003 0618 LD B, 24 SAVE IT FOR LATER PRTLNE PUSH BC: 3005 05 : VALUE FOR DSPLY TURN ON 3006 3E81 A.81H (QEEH) A IDSPLY MEM SWITCH PORT 3008 D3FF OUT : NUM CHARS/LINE 300A 0650 LD 8.80 300C OEOD LD CAODH CARR RET ADVANCES PRINTER SUPERVISOR CALL CODE I D A, 19 300E 3E13 EXECUTES SUPERVISOR 3010 CF RST INCREMENT TO NEXT LINE DE - 80 3011 115000 L D SET UP NEW TRANSFER LOC 3014 19 ADD HL, DE SET CURRENT LINE NUM 3015 C1 POP 8C CHECK, JMP BACK IF NOT DONE 3016 10ED DJNZ PRTLNE 301A D3FF OUT (OFFH),A DSPLY MEM SWITCH PORT SUPERVISOR CODE JMP TRSDOS 301C 3E24 I D A.36 :EXECUTES SUPERVISOR 301E CF RST

Model II Machine Code for Printing the Display Contents

END

The number of lines to be printed can be easily changed (3004H). So can the end of the program, both by adding a form feed instruction, or returning or jumping to another routine instead of back to TRSDOS. I use this routine in a larger program, which examines and edits specified sectors of the disk. I call this routine whenever I want a copy of the information (sector data) on the screen. Of course, my printer has already been initialized and is on line.

One of the key points of the routine is the knowledge of the port and the value sent to that port to perform the operation. I have a 64K Model II and the turn-on value is 81H and the turn-oft value is 0.

I hope this routine will be useful for those needing a simple but effective print routine when coding in assembly or machine language for the Model II.





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when we work with dates in real life, we look at our digital watch or calendar. Whenever we have to compare several dates, we let our fingers do a lot of walking through the calendar, because we cannot use simple arithmetic when subtracting one date from another.

We use the Gregorian Calendar which was established in the early Middle Ages. Our computer likes its dates simpler, however. Some large data processing installations are using the Julian date, named after good old Julius Caesar. The Julian date consists of five digits, the first two of which are the year, followed by a three digit day within that year. For example: 80039 is Feb. 8, 1980; 80061 is March 1, 1980.

When comparing two Julian dates within the same year, we merely subtract the lower from

the higher and have the elapsed days. If we go from one year to the next we first determine how many days are left in the current year, and then how far we want to go into the next year, and add the values together.

This program will convert a Gregorian date to a Julian date, or vice versa, via two entry points. To convert to a Julian date we furnish the subroutine with three values: the month trom 1–12 in 'MM', the day from 1–31 in 'DD', and the year from 10–99 in 'YY'.

GOSUB 12100 and the subroutine will return the five-digit
Julian date in the form YYDDD in
variable 'JD'. To convert to a
Gregorian date furnish the subroutine with the Julian date in
'JD' from 10001-99365, then
GOSUB 12200, and the subroutine returns with the Gregorian
month in 'MM', the Gregorian
day in 'DD' and the year in 'YY'.

Both entry points edit the entered data, and if they are in error, a message is printed and the return variables contain zero.

Look at the subroutine in Program Listing 1. There is a rather extensive REM section from lines 12000 to 12090. If you are pressed for space this part may be eliminated. In addition to the

variables 'MM', 'DD', 'YY' and 'JD', which are not destroyed, I am using the Y-family in this subroutine. 12100-12180 is the Gregorian-to-Julian routine, and we first link to another subroutine at 12300, which loads our table into variable 'VV\$', a subroutine within a subroutine.

Line 12110 edits the turnished Gregorian month, day and year within valid ranges. Any errors cause the logic to go to line 12180 which prints ERROR, sets variable 'JD' to zero and goes to line 12170, which is a RETURN statement.

The table in 'VV\$', (line 12300), consists of 13 elements, one for each month of the year, and one terminetor. Each element is five positions long, its first two positions indicating how many days each month has. The remaining three positions describe how far into the year the first day of the month is. The first element, 31001, is January. It tells us that January has 31 days and the first of January is the first day of the year (001). The next element, 28032, tells us that February has 28 days and February 1st is the 32nd day of the year. March 1st is day 60 of the year, etc. The table is adjusted for Leap years as well. A leap year is determined by dividing the year by four, and it there is no remainder, it is a leap year (see lines 12120, 12160, 12235 and 12240). If the test in line 12120 is not true, line 12130 is executed, and here we check that the submitted day is not larger than the last day of the month. We find the correct table element by multiplying the month by five and then subtracting four. This points to position one of the element, which is also position one of the number of days in this month.

Let's say, for example, the submitted month was 04 and the day was 31. We multiply four times five and subtract four = 16. The statement in line 12130 would say: If the day entered (31) is larger than the two positions in the string (the table) VV\$, starting at position 16, then it is an error. Counting off the 16th and 17th position, you find 30, indicating that the 31st of April is an error.

We have to use VAL because the day variable 'DD' is numeric and strings are alphanumeric. If the check pesses, in line 12140 the Julian day of the first of the month is picked up. If April 30th was submitted, again we find our month element and we are

pointing et position one of the three position day within the yeer field; 091 for April, to which we edd the day velue 30, end since we do not want to count the first day twice, we subtract one. The Julian day for the 30th of April is 120.

Line 12150 develops the five position Julian date by multiplying the submitted year by 1000 and adding the Julian day to it. It is In variable 'JD' and we can then go back to the mein routine. Before we RETURN we test for e leep-year and adjust our answer accordingly.

For any printouts and communication with the "other world" we need to reconvert Julien dates to Gregorian dates. Line 12200 is the entry point for the Julian to Gregorian conversion. Line 12210 resets some variables and also converts the submitted numeric Julian day in 'JD' to a string. If the Julian date is five positions long (es it should be) we will have six positions in our string V7\$.

The first position is for the sign. Line 12220 picks the five significant positions out of V7\$ and builds V6\$. We also split V6\$ into the year in 'YY' end the day in 'DD'. In line 12240 variable V4 is set up with a one if we are working with a leap year end the submitted day is larger than 59. Otherwise the value in V4 remains zero.

Lines 12250 and 12260 form a

loop, checking each table element's Julian day until a month is found whose entry is larger than the submitted day in 'DD'. On checking each entry the value in V4 is added to it and this has the same effect as if all day fields from March on are larger by one in the case of leap year. On leaving the loop we are one month too far, and in line 12270 in V3 the dey element of the preceding month is picked up. If this picked up day is larger then 32, it's added to the value in V4, which in the case of a leep year hes the seme effect as if the day fields from March-December

were larger by one.

in line 12280 we subtract the picked up day in V3 plus one from the submitted Julian day, and the result is the desired Gregorian day in 'DD'. We know that we went one month too far and reduce the month counter V5 by one, which goes into 'MM'. The year has been in 'YY' since line 12220. Line 12290 returns to the main program, and line 12295 is the error line.

To try the subroutine, see program listing 2 for a small driver which alternates between the two entry points, and also checks for a zero return.

```
12888 'THIS DATE-CONVERSION SUBROUTINE BAS 2 ENTRY POIN
     TS :
12005
                 12188 CONVERTS FROM GREGORIAN TO JULIAN
          1)
     OATE
12818 '
           2)
                 12200 CONVERTS FROM JULIAN TO CREGORIAN
     CATE
12828 'WHEN CONVERTING TO JULIAN OATE, SUPPLY THE CREGO
     RIAN
12025 'DATE AS FOLLOWS : HONTS
12030 ' DAY
                                   (1-12) IN VARIABLE 'MM'
                                                          י מם י
                                    (I-3I)
12035 '
                            YEAR
                                   (18-99)
12848 'ASD TSE JULIAN DATE NILL BE IN VARIABLE 'JD' AT
     EXIT
12045 'AS YYDDD (YY-YEAR, DDD-DAY WITHIN YEAR)
12050 ' EXAMPLE : 02,00,00 (FEB.8, 1900) IS
                      02,00,00 (FEB.8, 1900) IS 00039
03,01,00 (MAR.1, 1980) IS 00061
12055
      ETC.
12869
12865 'WHEN CONVERTING TO GREGORIAN DATE, SUPPLY THE JU
     LIAN
12070 'DATE IN VARIABLE 'JD' AT ENTRY, AND AT EXIT THE
     VARIABLES
12075
                           'MM' WILL CONTAIN THE CRECORIAN
      HTHOM
12888
                           1 DD 1
      DAY
12005
                           177 1
YEAR
12698 '111 THE YEARS 18-99 IN THE 28TH CENTURY ARE ASSU
     111 G3K
12188 COSUB 12388 ' GREGORIAN TO JULIAN ENTRY, LOAD TAB
I2I18 IF MM<1 OR MM>12 OR DD<1 OR DD>31 OR YY<18 OR YY>
     99 THEN 12188
12128 IF DD=29 AND MM=2 AND INT(YY/4)*4=YY THEN 12148
12138 IF DD>VAL(HID$(VV$,MM*5-4,2)) T8E8 12188
 2148 V1=VAL(NID$(VV$,MM*5-2,3))+DD-1
12150 JD=YY*1000+V)
12168 IF INT(YY/4) *4=YY AND MM>2 THEN JD=JD+1
12178 RETURN
12188 PRINT" E R R O R": JD=8:GOTO 12178
12200 COSUB 12300 ' JULIAN TO CREGORIAN ENTRY, LOAD TAB
12218 V4=8:V5=8:V7$=STR$(JD):IP LEN(V7$)<>6 THEN 12295
       ERROR
12228 V6$=MID$(V7$,2,5):YY=VAL(MIO$(V6$,1,2)):DD=VAL(HI
12238 IF YY'18 OR OO<1 OR OO>366 THEN 12295 'ENROR 12235 IP INT(YY'4)*4 <> YY ANO DD=366 THEN 12295 'ERROR
12248 IF INT(YY/4) *4=YY AND DD>59 THEN V4=1
12250 V5=V5+1
      IF DD=>VAL(MID$(VV$, V5*5-2,3))+V4 THEN 1225#
12270 V3=VAL(HID$(VV$,V5*5-7,3)):IF V3>32 TBEN V3=V3+V4
12280 DD=DD-V3+1:MM=V5-1
12290 RETURN
12295 PRINT"E R R O R":MM=0:DD=0:YY=0:GOTO 12290
            31001200323106030091311213015231102312133024
12300
      431274363653133586367 ":RETURE
```

```
Progrem Listing 1. Subroutine.
```

```
18 CLS:CLEAR 288
20 1NPUT"ENTER GREGORIAN DATE (MM,DD,YY) ";MM,DD,YY
25 IF MM=0 THEN END
36 GOSUB 12186
48 IP JD=0 THEN 28
56 PRINTTAB(33) MM;"-";DD;"-";YY;" IS =";JD:PRINT
68 INPUT"ENTER JULIAN DATE (YYDDD) ";JD
78 GOSUB 12286
88 IF MM=0 THEN 68
98 PRINTTAB(27) JD;" IS =";MM;"-";DD;"-";YY:PRINT
188 GOTO 28

Program Listing 2. Driver.
```

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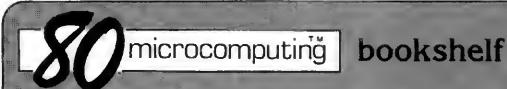
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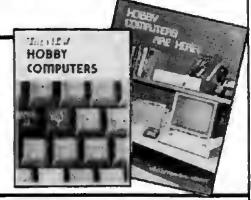
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19 CLS:X=5712:AS="E":FORZ=1T0124
29 X=X+1:IPPEEK(X)<128THENAS=AS+CHR\$(PEEK(X)):GOT020

- 30 PRINTZ+127; A\$,: IFZ<61A=6176+2*ZELSEIFZ>87ANDZ<124A=5
- 32 B=PEEK(A):C=PEEK(A+1):PRINTB;C,B+C*256; 35 FORY=1T0100:NEXT
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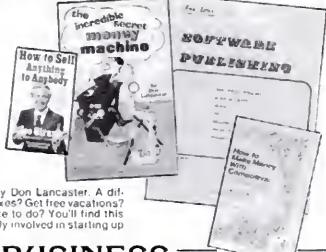


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32	TIONS (Combines Business, Homoraphics greeting card impact printer braille ISP research aid Decision-making program Calculus on the TRS-80 fracking church collections Avoid process over-adjustment Home eccounts manager Printing quotes on the TRS-80 fex record program nex articles. Algebraic equation solutions Produce biorhythm curve Organize the workload Plot spending Genealogical research aid Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Anway product list Algebra Radio log Bookkeeping Grocery shopping Company stock seles plan Genetics Cattle breeding program	Merry TRSMAS Braille Telepathy Decisions, Decisions Oh No! Calculus Passing the Plate Process Control Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biothythms Duty Roster Graph Plotter Soundex Codes Itinerry Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's Down the Road	Taylor Bruey Warren Walton Joffe Reikers Hotfman Andresen Barnes McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels Hastings	11:222 12:82 12:94 CAMES 1:36 1:90 3.55 4:60 4:116 6:116	Self-modifying code Learn simple graphics Dimensioning arrays How to program arrays (Combines Recreation) Music generation Horse handicapping Self-modifying games Beyond ping-pong Children fearning game Predict your answer Tic-tac-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation Betting program	Smart Programs Inside-out Debugging Into the 80's, Part 4 A Manipulative Wizard Music, Maestro Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starfighter Life in the Fast Lane U-Boat A Heartbeat Away	Lovy Ogren Sinclair Adams Pape Wilson Lopez Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
54 E: 56 D D 56 D D 56 D D 57 D D 58 D D D 58 D D D D D D D D D D D D D D D D D D D	ESP research aid Decision-making program Calculus on the TRS-80 Frecking church collections Avoid process over-adjustment Home eccounts manager Printing quotes on the TRS-80 Fex record program Index articles Algebialc equation solutions Produce biorhythm curve Drganize the workload Plot spending Genealogical research aid Geep track of travel plans Referencing magazine articles Laptioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Telepathy Decisions, Decisions Oh No! Calculus Passing the Plate Process Control Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biorhythms Duty Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Warren Walton Joffe Reikers Hoffman Andresen Barnes McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	12:82 12:94 CAMES 1:36 1:90 3:55 4:60 4:116 6:116 6:115 28:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Dimensioning arrays How to program arrays (Combines Recreation) Music generation Horse handicapping Self-modifying games Beyond ping-pong Children learning game Predict your answer Tic-tac-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Into the 80's, Part 4 A Manipulative Wizard Music, Maestro Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Pape Wilson Lopez Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
56 Direction of the control of the c	Decision-making program Calculus on the TRS-80 Irracking church collections Avoid process over-adjustment Home eccounts manager Printing quotes on the TRS-80 Iex record program Index articles Algebraic equation solutions Produce biorhythm curve Organize the workload Plot spending Genealogical research aid Geep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Amway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Decisions, Decisions Oh No! Calculus Passing tha Plate Process Control Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biorhythms Duty Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Walton Joffe Reikers Hoffman Andresen Barnes McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	12-94 CAMES 1:36 1:90 3.55 4:60 4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	How to program arrays (Combines Recreation) Music generation Horse handicapping Self-modifying games Beyond ping-pong Children learning game Predict your answer Tic-tac-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation	A Manipulative Wizard Music, Maestro Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Pape Wilson Lopez Lewis Harns Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
114 C TO TO TO TO TO TO TO TO TO TO TO TO TO	Calculus on the TRS-80 Fracking church collections Avoid process over-adjustment Home eccounts manager Printing quotes on the TRS-80 Fex record program Index articles Aligebraic equation solutions Produce biorhythm curve Organize the workload Plot spending Genealogical research aid Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Aniway product list Aligebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Oh No! Calculus Passing the Plate Process Control Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biorhythms Duty Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Joffe Reikers Hoffman Andresen Barnes McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	QAMES 1:36 1:90 3:55 4:60 4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	(Combines Recreation) Music generation Horse handicapping Self-modifying games Beyond ping-pong Children learning game Predict your answer Tic-tac-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Music, Maestro Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starfighter Lifa in the Fast Lane U-Boat	Pape Wilson Lopez Lewis Harns Krutch Dilleham Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
70 T: 104 A A 1114 H 122 P P 122 P 122 T: 130 F 127 O C 130 P 138 G C 128 S 130 E 121 C 123 L 121 C 122 C 122 C 122 E 123 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 122 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 123 C 12	Fracking church collections Avoid process over-adjustment Home eccounts manager Printing quotes on the TRS-80 Fex record program Index articles Aligebraic equation solutions Produce biorhythm curve Progranize the workload Plot spending Genealogical research aid Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measuraments Replacing columnar worksheets Preparing exams on an 80 Mathematics Aniway product list Aligebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Passing the Plate Process Control Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biothythms Duty Roster Graph Plotter Soundex Codes Itmerery Magazine Index Titler 1 Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Reikers Hoffman Andresen Barnes McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	1:36 1:90 3:55 4:60 4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Music generation Horse handicapping Self-modifying games Beyond ping-pong Children learning game Predict your answer Tic-tac-foe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Wilson Lopez Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
104 A H 114 H 122 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127 P 127	Avoid process over-adjustment frome eccounts manager Printing quotes on the TRS-80 Fex record program natural fex record program natural fex record program natural fex record program natural fex record program natural fex record program natural fex record produce biorhythm curve produce biorhythm curve produce biorhythm curve produce biorhythm curve produce biorhythm curve produce biorhythm curve produce biorhythm curve produce biorhythm curve produce natural fex fex fex fex fex fex fex fex fex fex	Process Control Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biorhythms Outy Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Outz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Hoffman Andresen Barnes McNell, Jr Sparks Joffe Holtheusen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	1:36 1:90 3:55 4:60 4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Music generation Horse handicapping Self-modifying games Beyond ping-pong Children learning game Predict your answer Tic-tac-foe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Wilson Lopez Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
114 H H 222 P P 22 P P	Home eccounts manager Printing quotes on the TRS-80 fex record program ndex articles Algebraic equation solutions Produce biorhythm curve Organize the workload Plot spending Genealogical research aid Geep track of travel plans Referencing magazine articles Laptioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Annway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Household Accountant Printer's Apprentice TRS-80 KWIC Index Equations Biorhythms Outy Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Outz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Andresen Barnes McNell, Jr Sparks Joffe Holfhausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	1:36 1:90 3:55 4:60 4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Music generation Horse handicapping Self-modifying games Beyond ping-pong Children learning game Predict your answer Tic-tac-foe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Tout 1 4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Wilson Lopez Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
22 P 22 P 22 P 22 P 22 P 22 P 22 P 22	Printing quotes on the TRS-80 fex record program index articles Algebraic equation solutions Produce biorhythm curve Organize the workload Plot spending Genealogical research aid Geep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Printer's Apprentice TRS-80 KWIC Index Equations Biorhythms Outy Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountents Aid Outz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Barnes McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Klungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	3.55 4.60 4.116 6.116 7.152 8.42 8.50 8.59 8.62 8.68 8.76 8.84 9.216	Self-modifying games Beyond ping-pong Children fearning game Predict your answer Tic-tec-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation	4K Intelligence Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Lopez Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
122 Ti 30 Ir	fex record program ndex articles Algebraic equation solutions Produce biorhythm curve Drganize the workload Plot spending Genealogical research aid Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	TRS-80 KWIC Index Equations Biorhythms Duty Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	McNell, Jr Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Biechman Daniels	4:60 4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Beyond ping-pong Children fearning game Predict your answer Tic-tac-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Ball Box Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starfighter Life in the Fast Lane U-Boat	Lewis Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
80	ndex articles Algebraic equation solutions Produce biorhythm curve Organize the workload Plot spending Genealogical research aid Geep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Annway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	KWIC Index Equations Biorhythms Duty Roster Graph Plotter Soundex Codes Itinerery Mapazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Sparks Joffe Holthausen Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	4:116 6:116 7:152 8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Children learning game Predict your answer Tic-tac-toe Adventure Star Irek type Space war Language versions Submarine game History re-creation	Rocks, Scissors, Paper True or False? The Third Dimension Swords and Sorcery II Star Search Starfighter Lifa in the Fast Lane U-Boat	Harris Krutch Dillehay Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
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127	Organize the workload Plot spending Genealogical research aid Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Outy Roster Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountents Aid Outz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Straw King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8:42 8:50 8:59 8:62 8:68 8:76 8:84 9:216	Adventure Star Irek type Space war Language versions Submarine game History re-creation	Swords and Sorcery II Star Search Starlighter Life in the Fast Lane U-Boat	Adams Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
130	Plot spending Genealogical research aid Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measuraments Replacing columnar worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Graph Plotter Soundex Codes Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountents Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	King Hodga Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8:50 8:59 8:62 8:68 8:76 8:84 9:216	Star Irek type Space war Language versions Submarine game History re-creation	Star Search Starfighter Life in the Fast Lane U-Boat	Berenbon and Gentile Ferrera Kepner and Grace Borrmann Morey
138 G 156 K 114 R 1621 C 1623 C 1628 S 1628 S 1648 P 1648 P 1648 P 1648 P 1658 A 166 A 166 A 167 B 167 B 167 B 167 B 167 B 168 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169 B 169	Genealogical research aid Keep track of travel plans Paterencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measuraments Replacing columnar worksheets Preparing exams on an 80 Mathematics Annway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Soundex Codes Iltinerery Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Hodga Gorsky Kiungie Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8:59 8:62 8:68 8:76 8:84 9:216	Space war Language versions Submarine game History re-creation	Starfighter Life in the Fast Lane U-Boat	Gentile Ferrera Kepner and Grace Borrmann Morey
95 K 114 R 1121 C 1223 L 122 C 1228 S 130 R 130 R 148 P 158 A 166 A 166 A 166 A 167 E 1174 C 1174 C 1176 F 1176 V 1176 C 1176 C 1177 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C 1178 C	Keep track of travel plans Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Annway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Itinerery Magazine Index Titler I Ching Carpool Model Conversion Accountents Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Gorsky Kiungle Rotzien Scarpalli McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8.62 8.68 8.76 8.84 9.216	Language versions Submarine game History re-creation	Life in the Fast Lane U-Boat	Ferrera Kepner and Grace Borrmann Morey
114 R 121 C 123 L 123 L 123 C 1228 S 130 R 148 P 158 N 152 A 166 A 166 A 166 A 167 E 174 C 174 C 175 P 175 V 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C 175 C	Referencing magazine articles Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columinar worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Magazine Index Titler I Ching Carpool Model Conversion Accountants Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Klungle Rotzien Scarpalli McCehan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8.62 8.68 8.76 8.84 9.216	Language versions Submarine game History re-creation	Life in the Fast Lane U-Boat	Kepner and Grace Borrmann Morey
121 C 123 L 123 L 123 C 1228 S 1320 S 148 P 148 P 162 E 162 E 162 E 162 E 162 E 162 E 162 E 162 E 162 E 162 E 163 C E	Captioning video productions Life's mood changes Carpooling Scale model measurements Replacing columner worksheets Preparing exams on an 80 Mathematics Aniway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Titler I Ching Carpool Model Conversion Accountents Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Scarpatti McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8:68 8:76 8:84 9:216	Submarine game History re-creation	U-Boat	Grace Borrmann Morey
123 L 128 S 128 S 128 S 128 S 130 R 1448 P 158 A 166 A 166 A 166 A 166 A 166 A 166 A 167 B 167 B 167 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B 168 B	Life's mood changes Carpooling Scale model measurements Replacing columiner worksheets Preparing exams on an 80 Mathematics Amway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	I Ching Carpool Model Conversion Accountents Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	McCahan Blackburn Sheats Eckert Thibodeau Blechman Daniels	8:76 8:84 9:216	History re-creation		Borrmann Morey
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128 S 130 R 130 R 148 P 148 P 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A 166 A	Scale model measurements Replacing columnar worksheets Preparing exams on an 80 Mathematics Annway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Accountents Aid Ouiz Master Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Sheats Eckert Thibodeau Blechman Daniels	8:84 9:216	-	A Heartheal Away	
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148 P 58 N 58 N 58 N 58 N 58 N 58 N 58 N 5	Preparing exams on an 80 Mathematics Annway product list Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Linear Meter Design Get the Whole Story Real Roots On the Radio Doctor Your Records Mind Your A's and P's	Thibodeau Blechman Daniels		AND ADDRESS BANKS WITH THE	Siot Machine	Fasor Moehlis
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662 A 662 B 666 P 662 B 667 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B 678 B	Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	Real Roots On the Radio Doctor Your Records Mind Youl A's and P's	Daniels		4K space game	Asteroid Adventure	
166 A 86 B 162 B 162 B 174 C 174 C 175 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 176 B 1	Algebra Radio log Bookkeeping Grocery shopping Company stock sales plan Genetics	On the Radio Doctor Your Records Mind Your A's and P's		*5.4.0	Description serve	Markward Hol	Taylo Herolo
96	Radio log Bookkeeping Grocery shopping Company stock səles plan Genetics	Doctor Your Records Mind Your A's and P's	Hastings	19.148	Proneering game	Westward Ho!	Morgan
162 E 174 6 174 6 174 6 174 6 175 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6 176 6	Bookkeeping Grocery shopping Company stock seles plan Genetics	Mind Your A's and P's		10:198	Word fingers	Puzzier Computer Magazak	Morga: Adam:
174 C 212 C 1188 G 1188 G 1176 F 1156 V 132 A 190 F 1114 C 1180 U 1212 C 1212 C 1213 F	Grocery shopping Company stock seles plan Genetics		Muehlig	11:83	Computerize the board game	Computer Monopoly Cheap Trills with T-8UG	Bok
1188 G 1106 C 1176 F 1156 V 1156 V 1156 V 1156 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 1158 U 11	Genetics	Down the Road	Leonard	11:168	Music program Manipulation topes	POW-BANG-ZAP-(CRASH)	Brandeiin
1106 C 1176 F 1156 V 132 A 190 F 1114 C 1580 E 1212 C 1109 C 1132 F			Vick	12:255	Manipulating tones Line drawing	CompuSketch	Hendrick
1176 F 1156 V 132 A 190 F 1114 C 1180 U 1212 C 1109 C 1132 F 100CATH 41 C 60 L 84 F 102 C	Cattle breeding program	Genotype	Rauber	12.230	Line drawing	Compagneton	***************************************
1:156 V 1:32 A 1:90 F 1:114 C 1:114		When the Cows Come Homa	Noyt				
1:32 A 1:90 F 1:114 C 1:180 E 1:212 C 1:108 C 1:132 F DUCATI 41 C 60 L 84 F	Homa heating	Cold Comfort	Keen and	GENER	AL		
132 A 190 F 1114 C 1780 E 1212 C 1109 C 1132 F 100 C 141 C 160 L 184 F 102 C			Laughlin	1:28	The Development of Tandy Corp	The Tandy Story	Brown
:90 F::114 C::180 U::212 C::108 C::132 F::132	Voltmeter	DVM Interface for the 80	Casper and	1:93	What they didn't tell you about	Hidden Codes and Missing	Q'Conne
190 F 1114 C 1180 U 1212 C 1109 C 1132 F 1000 C 1132 F 1000 C			Freedman		the TRS-80	Chips	
:114	A daily calendar	Your Personal Calendar	Colsher	1:138	How to use INKEY\$	Kayboard Information	Lov
:180 E :212 C :109 C :132 F :132 F :100 C :132 F	Photography program	The Fixer	Ashley	2:32	Story of a software firm	The Battom Shelf	Shufore
:212	Compute election results	Tally with an 80	Graham	2:106	Programming Shortculs	ROM Routines	Thielki
E:109 C E:132 F DUCATI 41 C 60 L 84 F 102 C	Utility bill program	Of Two-dimensional Arrays	Conhaim	3:79	Use computer expertise	Part-Time Consultant	Moni
DUCATI 41 C 60 L 84 F 102 C	Directory for PIMS	Mix your own PIMS	Busch	4:30	Hooked on computers	A Confession from a	Kornfiek
DUCATI 41 0 60 L 84 F	Computers in the office	The Office Computer	Valle			Computer Detailct	
41 C 60 L 84 F 102 C	Holiday greeting cards	Holiday Cheer	Kerr	4:98	Early days with the 80	A Dealer's Experience	DeFonz
41 C 60 L 84 F 102 C				5:36	New Languages for 80	Languages	Perr
41 C 60 L 84 F 102 C				5:44	Compiler in BASIC	TINYCOMP	Bohlk
60 L 84 F 102 C	ION (Combines tutorial, style)			5:46	High level command language	PUT-N	O'Brie
84 F 102 C	Computer education course	Night School	Lopez	5:50	Word processor	BASIC Word Processor	Hinrich
102 C	Learning Level I	Beyond Blackjack	Thorson	5:78	Meeting needs of a small	Business Programming	Clark
	Reclaiming programs	NEW Restored	Fordham		business		- m
130 H	Data sorting	Sort 80K in 6K!	Fitchman	5:107	80 user report	An Owner's Tale	Oilbec
	How disk drives work	A Disk Primer	O'Brien	5:110	Electronic messages	Computer Bulletin Boards	Cambro
73 (Computing square roots	Root Routines	Gerald	6:38	Generation graphics	The Game of Life	Kits
88 9	Move machine code with BASIC	Relocate with PEEKPOKE	Rappaport	6:62	Video patterns	Adventures in Roseland	Joll
94 i	Inbuilt assembly routines	Inside the ROMs	Stock	6:65	Plotting a bar graph	Randomness	Carpente
45 L	Upgrading to Level II	More Night School	Lopez	6:72	80 for doodling	Doodle Bug	Bisho
	Teaching children math	Pre-School Math	Hastings	6:78	Computerized kalaidoscope	Kalaidopen Bantima Graphics	Nichola Zidoni
	Doing away with ENTER	INKEY\$	Himler	6:82	PEEK & POKE simulations	Real-time Graphics	Meusha
	Elimineting effects of BREAK	Braak Oisable	Rastin	6:96	Level I examined	Inside Level I	Thi
	Searching data base by	Free Formet Search	Riekers	6:106	Double width characters with	Double Size Graphics	4 (4)
-	character			6	CHR\$(23)	Accemble Laguisco	Colstv
142	Fractions, variable data streams	Fractional Input	Cecii	6:118	Learning assembly language	Assembly Language Trainer	COISTA
140 F	PEEKing the keyboard	Keyboard Interrogation	Yarbrough				Kepn
			and Vosteen	8:124	Find references quickly	EDTASM Index Computer Education	Chartier an
94 (Calling routines	White	Commander	7:44	School labs	Computer Education	Goldne
108 \	Video display	Beginners' Formatting	Keller		Destiles Court Advers	How the Gamesman Ross	Robertso
144 \$	Steps	Towards machine language	Joffe	7:48	Profile: Scott Adams	How the Gamesman Began The BASIC Switchyard	Perkir
	Sort	Graphic Sort	de Zoysa	7:52	Commands Tee an	In the Beginning	Her
	Speed	Machine Code USR	MacDonald	7:28	TRS-80	Modification Update	Richard
124	Teaching 8id	Kidstuff	Keen and	7:84	TRS-80	Disk Files	O'Brie
		44	Dischert	7:88	Data files	Saving Money	Acre
	Reading music	Music Note Recognition	McClung	7:110	Computer consumer Model 11 entry	Rites of Passage	Keen at
	1 les existing	Variations on a Theme	Bullitt	8:148	modern anny		Dische
	Line printing	Into the 80's Part I	Sinclair	0-69	Computer's annual audit	A Bout with the IRS	Blechma
	Level it overview	Pulling Strings together	Adams	9:58	Computer's annual audit	BINAX KIBUFF	Bi
	Level if overview String handling	My Way	Meushaw	9:187	ROM commands	The "Next" Trap	Borrma
	Level if overview String handling Level I programming	Stringy Machine Code	Grimes	9:208	NEXT	Have the Courts Smashed	Kit
	Level if overview String handling Level I programming String packing	Math Flash	Barbarello	10:54	Copyright laws	Software Copyright?	KII
	Level if overview String handling Level I programming String packing Flash cards		Gorsky		MEMORY BIZES		Deck
0:93	Level II overview String handling Level I programming String packing Flash cards Cryptology	An Article Called Intrepid	Pape	10:114		Memory Sizar	Tayi
0:68	Level if overview String handling Level I programming String packing Flash cards	Ger Serious	Sinclair	10:140	Disk storage	Punch Out Your Disks	
0:78	Level II overview String handling Level I programming String packing Flash cards Cryptology	Get Serious Into the 80's—Part II		11.27	-	Dinateon in Alasto, and a	ロハハハバナ・
0:100	Level II overview String handling Level I programming String packing Flash cards Cryptology RESTART	Ger Serious	Adams Kepner	11:62 11:109	Computer networks (feature)	Electronic Networks Radio Shack vs the	Robertso Buso

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	Coordinate graphics Menu selection	The Random Walker Menu List Selection	Strazzarino Rowlett	8n	Reviews	
		Subroutine		00	11641CW3	
11:234	Index to Scripsit tapes	The Table of Contents	Thurlow			
12:66	Keyboard modification to Dvorak	The Dvorak Keyboard	Boyd and		Books	
	method		Elherton			
12:268 12:260	Printer switch modification Program dates in Julian or	Turn-On Gregorian Converter	Nestor Borrmann	PRODUCT	HARUPACTURAN	18506
	Gregorian	•		IEEE TRINGS W/PERSONAL COMPUT.	TAB BOOKS	DEC/11
GRAPHI	rce.			88 PROGRAMS FOR THE TRS-88	NAYME GREEN, ING. 88 AM PUBLISHING	AFR/88 FER/88
7.76	4K	Simple Graphics	Hommel	AN INTRO. TO COMPUTER MUSIC	JOHN WILEY & SONS, INC. WINTHROP PUBLISHERS, INC.	DEC/84 REP/81
7:128	Plot variables	Scatterpiol	Genovese	COMPUTER GAMES FOR BUS. 4 SCHL. FREELANCE SOFTWARE PUBLISHING	RERS PUBLICATIONS	FEM/88
	Figures	Curve Plotter	Cecil	GUIDE TO TRS-88 INFORMATION INSIDE LEVEL II	F.L. MUHEMER MUMPORD RICRO SYSTEMS	PEB/85 OCT/85
7:140	SET, RESET, POINT	BASIC Drawing	Gorsky	INTRO, TO TRE-BH GRAPHICS INTRODUCTION TO T-BUG	DILITHIUM PRESS DILITHIUM PRESS	A#3/86 30L/86
11:220	Draw simple patterns	Images	Gorsky	LEARNING LEVEL II	COMPUSOFT PUBLISHING VIRING PRESS	ARY/II AUG/II
12:112	Christmas scenes	Seasons Greetings	Vann	NICRO RILLENIUM, TRE HOST POP. SUBROUTINES IN BASIC	TAB BOOKS	NOV/III
12:128	Calendar printoul program	CAL81	Strazzarino	PASCAL-INTRO TO LOGICAL PCHNG, PER, GUIDE FOR COMPUTERISTS PROB SOLVING/STRUCTURED PCENN.	COMPUTER SCIENCE PRESS E. BERG ADDISON-WELEBLEY	AAY/88 FEB/88 ARY/88
				PROGH TECHS FOR LEVELL BASIC	TAMBY/ANDID SHACE LIFETIRE LEARNING PUBLICATIONS	MOV/85
	ARE (Combines Inferface, Construc	-		PROGRAMMERS BOOK OF RULES, THE RECREATIONAL CONFUTING	PEOPLES COMPUTER CO.	FEB/88
1:62	About cassette hang-ups	Cassette Problems	Stoner and	RUNKING WILD, THE NEXT IND. REV SOFTWARE MUYERS GUIDT	OSSORME/MCGARM HILL WALLACE ELECTRONICS	46/44A
		Level the Model 22	Barker Colby	SSI RICHO ROPTHARE GUIDE, THE SEIPERNAP	551 FULLER SOFTWARE	JUL/88
1:70	Line printer interface	Level II to Model 33	Richardson	TRS-88 DISHSSENBLED HANDBOOK TRS-88 INTERFACING	RICHGRAFT ENGINEERING BLACKSBURG EDUCATION SERIES	JUR /88
1:78 1:104	Protecting cassette relays Turning the 80 into a terminal	Relay Protection Smart Terminal	Shirley	TRS-11 MONTHLY NEWSLETTER	HAZ COMPOTROMICS	7 EB/84
1:109	Debounce with audio feedback	Listen to Your Keyboard	Domuret	TRS-BE TECHNICAL REFERENCE MAN	TAMBY/ANDIO SHACE	ARY/84
1:132	Simplify CLOADing	CLOAD Fix	King		all all bearing	
2:50	Speed up programs	Faster! Faster!	Kitsz	Н	ardware	
2:54	Cassette Hang-ups II	Cassetta Problems II	Stoner and		M & MILE ACRETICATO	**===
			Barker	PRODUCT	HARUFACTURES	15.MZ
2:62	Fix up your monitor	Video Tune-up	Miller			
2:94	Interface switches to system	A Simple Interface	Mullin	ACU-DATA TAFÉ DIGITITER AMADEX FRINTER	ALPHABETICS AFG.	JUM/25 120/10
2:100	Inexpensive hard copy	LPRINT "Cheap"	Blechman	BETA-BI CENTRONICS 738 PRINTER	RECA CENTRONICS INC.	ARY/44
3:72	Software-driven modification	lowercase & UPPERCASE	Stoner and Barker	COMPRINT 912	COMPUTSE PRINTERS INTERNATIONAL	NOV/88
2-00	And a havednormal transact	Rahuhun Keunad	Barker Kitsz	DB-9586 LINE PRINTER EXATRON STRINGY PLOPPY	ANADEE, ING. EXATROM	ARY/BE
3:88 3:96	And a hexadecimal keypad Ruild your own interface	Babybug Keypad Home Brew Interface	Vince	BIGE SPTED MODIFICATION AIT MAYDRY +B	SIMUTEX SUR-SESZARCH INC.	MOV/80 JUR/80
3:96 3.113	Build your own interface Fix TRS-80 power glitches	Regulate It!	Klungle	RICHOLINE-BB MODEL 44E PAPER TIGES	ONIDATA INTEGRAL DATA SYSTEMS, INC.	OCT/SE
3:120	Interface Intel 8255	I/O Parts Plus	Harron	MODEL BEE PRINTER	BASE-2	A1>/14
3.132	Cabinet for the 80	Box it in	Zatnerunas	PERCON DISK DRIVES QUICE PRINTER	PERCON CENTRONICS DATA COMPUTER CORP.	HAN/##
4:38	Constructing a light pan	Build a Light Pen	Holder	AS-232 BOARD TC-8 CASSETZE SYSTER	TAMDY/ARDIO SENCE JPC PRODUCTS	30R/88
4:54	Reversing your video	Reverse Video	Kitsz	TRENDOM INE PRINTER	TREEDCON TAMDY/ANDIO SHACK	AUG/88
4:58	Hooking up to TV	Mork and Mindy Monitor	Jackson	TRS-88 NODEL 11	TABDY/RADID SRACK	JUL/11
4:110	Improving CTR-41 recorder	CTR-41 Modifications	Hinrich	TRS-88 VOICE SYNTHESIZER	TASDY/RADIO SHACK	SEF/ 10
5:70	Adding extra memory	Homebrew Memory	Ragucci			
5:74	Prevent cassette welding	Destrok Your Relay	Lukoff	1	Software	
5:84	Metering load levels	CLDAD Micrometer	Thief			
6:136	Automatic test measurement	Testing 1,2,3	Nelson	PRODUCT	RANUTACTURES	IESUZ
0.113	check Model 33 with no hardware mods	Teletype Interlace	Noeth			
6:142 6:154	External fuse to power supply	Fuse Fix	Winter	ADVENTURE AIR PLIGHT SIMULATION	SOFTRIN ASSOC/NICROSOFT INSTANT ADPTHARE ING.	JUR/II APR/II
7:112	Cassette recorder	Relay Assistant	Jahns	ANDBOID NIM	as-NW PUBLISHING CO.	FED/10
7:116	A/D conversion	Two Different Worlds	Eckert	APPLICATIONS AUTOR AND GEDIT	DILITHIUM TAPAS DISCOVERY BAY SOFTHAME	A73/84 FEB/83
7:156	Prevention	Disaster Saver	Brooks	BASIC 1P BOOTSTRAP	SMALL SYSTEMS BOPTHAME PRACTICAL ARPLICATIONS	JUL/88
7:114	H14 printer	Heathkit Interface	Kunk	BUSINESS ARIL SYSTEM C BASIC	THE BOTTOM SHELF PNG CORP.	P2B/11 API/81
7;144	Printer	TTY Interface	Rumodit	DISK DIRECTORY	HUMFORD HICROSYSTERS TRADY/ARDID SHACE	JAN/ES NOV/ES
8:136	UO ports	300 Baud Terminal	Loos	DISK INSTRUCTION COURSE DISK MOD	MISOSYS	DEC/SE
B. 116	TV interface	Cheap Video	Fowler and	DOCTOR AND FETCH EDAS 4.8	ORICSON SOFTWARE GALACTIC SOFTWARE	AUC/20
0	CHOICE AND A TO	DO AT Deserted by the second	Murray	EDUCATIONAL ESP-1	DILITRIUM TAPES SMALL BYSTEMS SOFTWARE	AFA/88
8:152	SWTPC interface	PR-40 Printer Interface Teletron Interface	Hise Commander	GAMES GENERALIZED SUBROUTINE FACILITY	DILITHIUM TAPES RACET COMPUTES	APR/80 JAR/81
9:84	Interface IBM interface	Teletype Interface Selectric Hard Copy	Bickerton	GOMORU	DISCOVERY BAY SOFTWARE	P2D/88
9:102 9:116	Port Port	Build Your Dwn Part	Hawkes and	GMAPHICS AND MISCELLANEOUS IOM-IV DATA BASE MANAGER	DILITHIUM TAPES RICRO ARCHITECT	HOV/##
5.710	. 4.1		Reese	INDIVIDUAL STUDY CENTER INSEQ-80 AND INSORT-88	TTC SOFTHARE S & M SYSTEMS, INC.	APR/88 OCT/88
10:82	Video monitor	The Light Pen	Jackson	INTERLUDE -ULTIMATE EXPERIENCE	SYRTONIC SOFTHARE JOHRSON ASSOCIATES	82 P/88
10:122	Serial I/O board kit	Caveat Emptor	Parris	ISAF, IMPO, STORAGE & RETRIEVAL	THE ALTERNATE SOURCE [TAS] THE ALTERNATE SOURCE (TAS)	DEC/84
10:182	Level II mod	Two BASICs are Better than	Erickson	REEPIT VERSION 2.8 LEVEL 1 IN LEVEL 11	APPRANT SOFTWARE	DEC/88 NAN/86
		One		LEVEL III LINE REMURBERING	RICROSOFT SOFTHAPE ABSOCIATION	JAR/88
10:118	H14 printer	H-14, Meet the TRS-80	Friesen	RAIL/PILE LIST ARILLIST	GALACTIC SOFTWAPE DAR SALES	PER/SS OCT/SS
10:144	Printer	Interfacing the NEC	Kunzman	ARTHEMATICS MAXI-DISK AND SBUFFLEBOARD	DILITHIUM TAYES PANASITIC ENG.	APR/86 ARY/86
10:194	LIST	Spinwriter The Serial Clank on the	O'Brien	RAXI-DISK AND SHUFFLEBOARD RICRO-OPOLY	TAMBY/RADIO SHACK LEVEL IV PRODUCTS, INC.	OCT/88
10.104		Printer		ANS FORTH PION-2	NILLER RICROCOMPUTING BERVICAN HUDERT MONE	PEB/88
11:116	Install an extra 4K	Mem Size20K!	Stanley	MORSE CODE KHIT & REC PGR. REVING SIGNBOARD	BICHCRAFT ERGINEERING CIRCLE ENTEAFRISES	JUL/40 FER/14
11:146	Build a microcomputer	Homebrew TRS-80	Steele	MUSIC COMPOSER/EDITOR	FEDC SOFTHARE	JAN/88
11:216	Protect cassette relay	Look, a Snooper/Snubber!	Martel	MAME AND ADDRESS SYSTEM OBJREL	SAALL BOSTNESS SYSTEMS GROUP BUBERT NOWE	723/84 723/84
12:186	Joystick construction	Joystick City	Suter	PEOPLE'S PASCAL I ARD II PLANETARY LANDER	COMPUTER ISPORMATION EXCHANGE INC.	SEP/84
				POUR MAN'S TEXT EDITOR FTMANID	DON COOM TANDY/AADIG BRACK	PRE/SE AUG/SE
REVIE		Out Own :	~ .	RADEL-IN RADIO SHACK MRILER	IJG COMPUTER SERVICES DIV. TANDY/RADIO SERCE	JUL/84 PRS/84
1:34	Disk directory	Disk Orrectory	Ailey	REMODLE-PAGLOAD	RACRT COMPUTES	HAR/80
1:48	Four programs reviewed	Software Review Rival Publications	Hallen	RENGMER RSM-2 MONITOR	TANDY/RADIO SHACE SHALL EXSTENS SOFTWARE	HAR/ES APR/ES
11/4	TRS-80 publications Diek mail systems	Three Mailing Programs	Hallen Fowler	SCRIPSIT SORT-II	TANDY/RADIO SEACE HOSTNEAST NICHONAVE	PER/80
	Disk mall systems Mail Program	Radio Shack's Mailer	Buell	SPECIAL DELIVERY	SOFTHAPE ETC.	JUL/ #5
2:24	maii riogiam	Rival Publications II	Hallen	STEP BY STEP	PROGRAM DESIGN INC. WER ARSOCIATESD	721/11 AP1/00
2:24 2.26	The competition		1184118311		SMALL SYSTEMS SOFTWAPE	OCT/88
2:24 2:26 2:36	The competition Fight applications programs		Hallen	TRS 232 FORMATTER	COMPU-0007F	712/11
2:24 2:26 2:36 2:58	Eight applications programs	Software Review II	Hallen Buffington &	VIDEO CHECKERS NIN 21	COMPU-QUOTE DISCOVERY BAY SOFTWARE	718/15 723/05 208/20
2:24 2:26 2:36			Hallen Buffington & Wagner	VIDEO CHECKERS	COMPU-QUOTE	718/15 718/20 708/20 HOV/08 SEP/04

2:80	Disk database	Floppy PIMS	Herman	5:134	Block movement	Cutting and Splicing BASIC	Nottingham Powers
2:97	Four games reviewed	Games Review	Hallen	5:136	Printing the screen	LPVIDEO	
2:111	Cheap text editor	Poor Man's Text Editor	Blechman	6.88	Displaying hex conversions	Hex Oisplay	Campbell
3:58	Three programming aids	Useful Unimes	Leedham	6:111	DECwriter LA-34	DECwriter Driver	Beauchamp
3:77	Private label compared	Ouick Printer	Piekers	6.132	Displaying buffer contents	Buller Analysis	Chambers Joffe
3:134	Level I in a Level II	One into Two	Wantz	8:134	Displaying lots of data	Display Formatting	Baker
3:136	Radio Sheck's interface	RS232	Hicks	6:146	Treat assembly like BASIC	CLOAD Assembly	Daker
4:70	Small systems software	RSM-2 Monitor	Churchill	2 400		Language	Baker
4:130	CBASIC from FMG	BASIC Review	Knecht	7:136	Sound generation	Sound X	Moshlis
4:136	Software from dillithium	Oillithium Tapes	Hallen	7:158	Backup copy	Oisplaced Programs	
5:38	Computer information exchange	Pascal I&II	Monsour	7:160	Tape duplication	TCOPY	Stevens
5:56	Word processors compared	Pencil vs. Scripsit	Perry	7:162	TRENDCOM 100	FORMAT 40	Adams
5:58	Extra commands with Level III	Level III	Bobo	8.100	Index	Tape Librarian	Herold
5:82	Stringy floppy and BETA-80	Disk Alternatives	Dyk	B:107	Security	The Invisible Pessword	Conley
6:92	Six programs from four	Applications Software	Hallen	8:108	Telling zeros	Slash Zero	Richardson
	companies		0.5	8:110	Cryptology	Code Cracker	Morgan
7:100	Morse code	Soltwarn for Hams	Aichardson	8:118	Security	Software Lock	Kelieher
7:124	Printer	Centronics 730	Frankenberg	8:121	Lowercase	Lowercase with Strings	Chepko
6:184	Operation	The TRS-80	MacLean		Marie ERTACA	Attached	Dinis
9:154	Voice synthesizer	Eloquent Eighties	Wright	8:122	Modifying EOTASM	Custom EOTASM	Blair
11:125	RS pocket computer	BASIC In the Palm of Your	Knecht	8:132	Combining machine and BASIC	AUTOPOKE	Kump
12.400	Clabelies orogane	Hand STATS	Johnson	8:160	Worksheet	The Graphics Coder Disk File Protection	Racine Keen and
12:102	Statistical programs	31413	Johnson	B:164	Sequential file	UISK FIRE Protection	Dischert
UTILITI	ES			8.170	Electric Pencil	Pencil RS232 Driver	Kinsey
1:68	Blinking cursor subroutine	Winking Cursor	Lovy	8.174	Tape index	Cassette File	Tallman
1:82	Renumber BASIC	Basic BASIC Renumbering	Orleff	9:68	Deleting spaces	Free Space	Cornei
1:118	Relocating T-Bug	Get T-Bug High	Rappaport	9:76	Keywords	Uni-key	Archei
1:120	Put EDTASM on DOS	EDTASM on Disk	Butler	9:88	Variable names	Document Those Variables	Noe
1:122	Tape analysis program	TTape	Stevens	9:94	Centronics 779	Printer Calibration	Rexrode
1:134	Increasing variables	Extra Variables	Clark	9:98	INPUT	Versatile Input	Wilde
2:42	Machine language monitor	BABYBUG	Kitsz	9:146	Index program	Reference Library Index	Morgan
2:68	Modify your monitor	CLOAD Machine Language	Schimelman	9:150	POSDIS	Position Display	Frost
2:82	Add BASIC statements	APPENO II!	Gerald	9:168	Delaying a program	Delay Loop	Joffe
2118	Program shrinker	Compress It!	Powers	9:170	Rectangles, ellipses, boxes	Orvine Proportions	Ceci
2:120	Format printouts	LPRINT Formaller	McCormick	9:173	Moving messages	Walking Words	Borrmann
2:124	Index program names	Oisk Index	Cheshire	9:192	Sort utility	Bayond Shell Melzner	Walker
3:46	Print files while running	SPOOL & DeSPOOL	Gentry	9:196	Debug monitor	Deflower Your Debug	Walter
3:80	Memory test	Test your memory.	Chepko	9:202	Scrotling	Slow Scroll	Lewis
3:105	Hard copy video	LPRINT Routines	Werner	9:206	Disk operation	OWIKOISK	Nazarian
3:115	identify system and BASIC tapes	Whazit?	Penny	9.210	Cursor	The Competition's Cursor	Bishop
3:122	Simple text editor	Screen Editor	Colsher	10:134	USR	Variable Scrolt	Colshe
3:125	Error messages in Level II	Extra Errors	Moses	10:138	INKEY\$	Input with Insight	Decke
4:62	CLOAD assembly programs	Lavel II to Lavel I	Wolf	10:202	Commands	Super Graphics	Moye
4:68	Adding sound effects	Sabybeep	Kitsz	10:207	Multiple loading into memory	Triple Play for T-8UG	Johnson
4:80	Adding USA subroutines	Multiple USRs	Ventimiglia	10:210	Maxell UD cassettes	Take Me Beyond Your	McTernar
4:84	Shortening T-BUG	T-BUG for II	Curtis			Leader	
4:90	Putting machine-language into	MACROPOKE Monitor	Suter	11:128	Code-tracking device	Cross Reference	Camp
	Level II			11:172	Dump memory with new T-BUG	T-BUG and Then Some	Paxtor
4:106	Consolidating SYSTEM	Service Tape	Flatley	11:177	Eliminate volume proolems	Up and Down	Parris
	programs		,	11:206	Recapture a lost program	Resurrect II	Quindry
4:108	Relocating KBFIX	KBFIX Fix	Andreesen	11:208	Add three loading instructions	DOS Machine Code	Turne
4:133	Designing an intelligent	BASIC Terminal	Noreault			Loading Techniques	Komfek
5:76	terminal Finding defective memory	Babyroot	Kitsz		PEEKing a directory Understanding Level II ROM	You Can Call It Ray Mysteries of the Level II	Griswok
	locations					ROM	Car
5:86	Determining quality of input	CLOAD Monitor	Whaland	12:160	Labeling and indexing routines	Now it's Time forName	Corne
5:96	ASCII and hexcodes on screen	Backup/Oisplay	Lindley	40 -0-	D-b-visa	That Tune	On-
5:114	Speed up DOS	FASTDOS	Neher	12:198	Robotics	COMPAC Assemble it Vousself	Romanchi
5:116	Designing and utilizing video	Etch-a-Screen	Shrum	12:212		Assemble it Yourself	Koc
	layouts			12:257	Controlling data pointers	RESTORE Data Pointer	Cec
5:126	Editing hybrid programs	Progdata	Kelley			Control	
5:130	Producing sound through	Super Sound	Morr	12:259	Printing the display	Less Is More	Winterbaue
	recorders			12:263	ROM vocabulary	Keyword List Plus	Decke

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Alpha Products Company		79	Allen Gelder Software			Okidata Corp	
8 The Alternate Source 18	9, 202, 249, 122	75	Godbout Electronics		389	Omega Sales	
6 The Alternate Source	64	218	Good Lyddon Data Systems	243	298	Orange Micro	
6 American Businass Computers	96	270	Mark Gordon Computers	161, 193	96	PCD Systems	
7 American Business Computers		23	Hobby World Electronics			Pacific Exchanges	
3 American Business Computers			Howard W. Sams and Co., Inc			Pecific Office Systems	
4 American Business Computers			Howe Software			Peiomar Softwere	
1 Ancie Lebs		37	IJO Inc.			Pan American Electronics	
4 Apperat, Inc		334	Information Technology Systems			Pensadyne Computer Services	
Applied Economic Analysis		300	Information Technology Systema			Percom Data Company	
Archbold Electronics		158	Image Computer Products Inc	56		Percom Data Company	
4 John Armstrong		306	Insiders Software Consultanta Inc			Percom Data Company	
8 Audio Video Systems		2	Instant Software38-41		1	Percom Data Company	
Automated Simulations			Instant Software		•	The Peripheral People	
1 Barstrann Corporation		492				Perry Gas & Oil	
Basics and Beyond Inc.						Personal Computer Systems	
		379	Integrated Service Systems Inc				
4 Balden Corp			Interface, Inc.			Personal Microcomputers Inc	
The Berg Works		287	Interlude			Persteve Electronics	
7 Big Five Software Company			Interpretive Education			Phermacy Associates	
7 Big Systems Software		187	International Software Assoc	215	17	The Program Store/Realsoft	106,
4 Bitznbytes		35	J. F. Consulting		21	Programma International	81, 116.
5 The Bottom Line			JLS			The Programmer's Guild	
The Bottom Shelf, Inc			JMS Corp.		441	Prosoft	
Bourrut Consulting Corp.			JPC Products			QC Microsystems	
						Quent Systems.	
Harry H. Britey			JR Software				
3 CMS, Inc			Joe Computer			Quarp Publishing	
3 CPU Shop	91	85	Johnson Associates	231	41	Racet Computes	
5 C&S Electronics Mart Ltd	171	149	Kogyosha Company	202	185	Radio Shack	
Caldats Systems			Krell Software		•	Realty Software Company	
Cecdat, Inc		53	LNW Research.		433	Red Arrow Electronics	
					70	Remsoft Inc	
			LTM Inc.				
9 Chicatrug News		174	The Lawtech Co			Richcraft Engineering Ltd	
Cload Megazine		•	Level IV Products Inc			Rite 60 Software	
3 CompuCover	117	•	Lifeboat Associates	239	468	Rochester Data Inc	
7 Computer Applications Unlimited. ,		471	Linnex Research Associates Ltd		244	SJW, Inc	
9 Computer Case Company		15	Lobo Drives International		•	S&M Systems Inc	
2 Computer Discounts of America		451	MTS Enterprises		261	Scientific Engineering Lab	
Computer Information Exchange		87	Management Systems Software		297	Service Technologies, Inc.	
8 Computer Program Associates		60	Manhattan Software, Inc			Michael Shrayer Software Inc	
		156			19	Simulek, 191	
					_		
1 Computers Unlimited			McClintock Corp		87	Sirius Systems	
Computermat			Measurement Systems and Controls.		30	Small System Software	
2 Computex			Med Systems Software		232		
5 Computex		421	Medfield Computer Software		434	Soft Sector Marketing Inc	
Computronics, Inc	138-145	•	Mediamix,	246	173	Soft Sector Marketing Inc	
4 Comsoft		104	Mercer Systems Inc			Software Efficiency	
Contract Services Associates		20	Meta Technologies Corp		42	Software Etc	
5 The Cornsolt Group		54	Micro Architect			Software Innovations	
3 Cottage Software			Micro Architect			The Software Mert.	
3 Creative Computing Press			The Micro Clinic			Southern Innovative Design (SID)	
Creative Developments			Micro Club	69		Speedway Electronics	
9 Crown Plastics		379				Standard & Poors	
Cryptext Corporation	158	182	Micro Developments Systems	60	455	Starrs-80	
Custom Computer Center,			Micro-80			Sterling Computer Products	
1 Custom Electronics		69	Micro Learningware		438	The Stocking Source	
Cybernetics, Inc.		72	Micro Management Systems Inc		82	Sturdivant & Dunn, Inc	
9 Cybernetics, Inc.		68	Micro Malrix		150		
9 D-Solt		29	Micro Mega.		151		
DFR Associetes			Micro Mint		266	Synapse Video	
Daltex			Micro Mnemonics		•	Synergietic Solar Inc	
Data Access Corp			Microperlpheral Corp			Syracuse R & D Centar	
Data Train, Inc.			Micro Systems Software Inc			Systems-80	
4 Data Trans	146		Micro Systems Software Inc			T.Y.C. Software	
3 Data Truss	136		Micro Systems Software Inc			Tab Sales Company	
6 Data Wholessle			Micro Tax		45	Taranto & Associates	
2 Decision Master/Interlude			Microcomp Software Systems		489	Tar Heel Software Systems Inc.	
D Discount Software Group			MicroCompatible Inc			Task Computer Applications	
2 Discovery Games			Microcomputer Systems		25	Texes Computer Systems	
Documan Software		28	Microcomputer Technology Inc		•	Three-G Company Inc	
B E. F. Dreyer	243	307	Microcosm, Inc	256	437	Tulsa Microsystems, Inc	
3 Dynatek Information Systems Inc			Microed		31	V R Data Corporation	
7 Edu-ware			MICROGRAM			Vem Street Products/Keyline Compu	
Eighty Microcomputing			MICROGRAM			Ten Steer Floodcarteyine Compa	
	10 DOL DOC AT-	427	Micron, Inc.		47.		
34, 50, 61, 161, 164, 2		-				Williams Enterprises	
Elcompco			Microtek, Inc		355	Zocchi Distributors	
9 Elcompco Microcomputer Periphera	us64	8	Midwest Computer Peripherals				
Electronic Specialists	130	112	Miller Microcomputer Services	127	4	This advertiser prefers to be contacted	ed directly

When It Comes To TRS-80 Add-on Memory...

LOBO Has

LOBO DRIVES manufactures disk drive subsystems designed to provide TRS-80° users with a wide selection of low-cost, high-speed, efficient, mass-storge capabilities. Every LOBO DRIVES Memory System is thoroughly tested and burned-in to assure reliability and carries LOBO's unique one year, 100% parts/labor warranty.

Expansion and enhanced capabilities are key words in achieving full utilization of your computer system. LOBO DRIVES complete line of TRS-80 compatible disk drive subsystems is the ideal, cost effective way to provide the expansion capabilities you need to meet your system growth requirements

*TRS-80 is a trademark of Radio Shack A Tandy Company

TRS-80 MODEL II

LOBO DRIVES makes expanding your TRS-80 Model II very, very easy. Now you can add more floppy disk memory at less cost And, LOBO can provide you with up to 40 MBytes of

fixed disk. Winchester technology storage capacity that is completely software compatible to your Model II.

- Model 800-850 8-inch dual Floppy Systems
- Model 1850 Dual Floppy/Fixed Disk Memory System

MODEL 1850 DUAL FIXED/FLOPPY DISK MEMORY SYSTEM

LOBO DRIVES has combined a 5 or 10 MByte Winchester technology fixed disk and 1.6 MByte double-sided, double-density floppy disk drive in one cabinet. The unique controller can accommodate two dual units. Now you can have the speed and reliability of fixed disk, with built-in floppy back-up.

- · 5 or 10 MByte Fixed Disk Capacity
- · Up to 1.6 MByte Floppy Disk Capacity
- Winchester Reliability
- Software Compatible

MODEL 800/850 DUAL FLOPPY DISK MEMORY SYSTEM

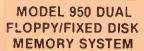
Complete with stylized cabinet, power supply, controller, interface, and cables, the Model 800/850 Dual Floppy Disk Memory System is the ideal way for the serious user to expand his disk-based TRS-80.

- . Up to 3.2 MBytes Capacity
- · Single-side, Single or Double Density
- Double-Side, Single or Double Density
- · Complete Software Compatibility
- High Speed Access Time

MODEL LX80 EXPANSION INTERFACE

LOBO DRIVE's new Model LX80 expansion interface enhances system performance by expanding disk storage capacities beyond 40 MBytes, adding a second serial port and facilities for an additional 32 K RAM. The LX80 permits you to achieve the maximum expansion capabilities of your TRS-80.

- · Connects Directly to Keyboard
- Two Serial Ports (optional)
- One Parallel Expansion Port (standard)
 - Dne Parallel "Centronics" Printer Port (Standard)
 - Supports Double Density
 5½ and 8 inch Floppies
 - Separate Port for 8-inch Floppies
 - Switch for Overriding Keyboard ROM
 - Separate Port for Fixed Disk Drives



LOBO combines the outstanding capabilities of the latest technological breakthrough in disk drives, the Shugart Technology 5¼-inch Micro Winchester fixed disk drive with the proven reliability of the Model 400/450 Floppy Disk in one

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- The Storage Capacity of 16 doublesided, double-density Mini-Floppies
- · Built-in Floppy Disk Back-up
- 170 Msec Average Access Time
- Sealed Environment/Winchester Reliability

NOTE Limited Availability in the Fall 1980



MODEL 400 51/4-INCH FLOPPY DISK MEMORY SYSTEM

A low-cost, high performance, softwarecompatible Floppy Disk for TRS-80 Model I users

- · Up to 220 KBytes Capacity
- Single/Double Density
- Soft Sector Format
- 298 Msec Access Time

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INTERNATIONAL

Pump Up Your TRS-80 with the ES/F Mass Storage System



▲ Actual Size

Actual Thickness V



THESE FACTS SPEAK FOR THEMSELVES!

	CASSETTE	ES/F	MINI-DISH
SPEEO (Seconds to load "Blackjad	56 ck'')	6 (5' wafer)	61/2
CAPACITY (thousands of bytes)	38 (C-20)	(75' wafer)	59 (TRSDOS)
RELIABILITY (Designed for digital data?)	NO	YES	YES ~
SYSTEM COST (First unit plus interface)	\$60)	\$250	\$800
MEOIA COST (in quantities or ten)	\$3 1C cassette	\$3.00 wafer	\$3.20 disk

Let's face it. Cassette players were not designed to store digital data and programs. That's why we designed a digital storage system using a continuous tape loop: the Exatron Stringy/Floppy (ES/F) and the Wafer. There's no expensive interface to buy—the ES/F comes ready to pump up your TRS-80.*

Once your TRS-80* is pumped up by our ES/F...you won't want to deflate it. We're so sure, that we offer an unconditional 30-day money-back guarantee and a one-year limited warranty. Over 2,000 TRS-80* owners have met the wafer...why don't you?

